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The "Direct Process" in Iron Manufacture.*

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I FEEL a certain sense of responsibility in bringing before you the subject of the direct process in iron manufacture. I am aware that, in such a body as I have now the honor of addressing, there are few who are not already so well informed upon its past history that it would be a weariness to them to listen to anything else than an account of practical success. Yet, to claim that success involves so much that, if I do not make good my claim, I deservedly expose myself to severe criticism.

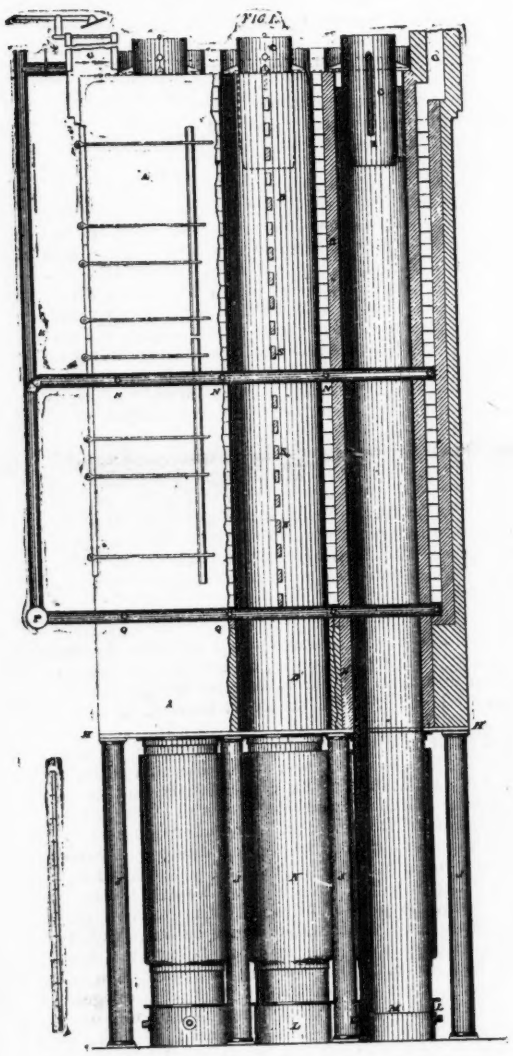
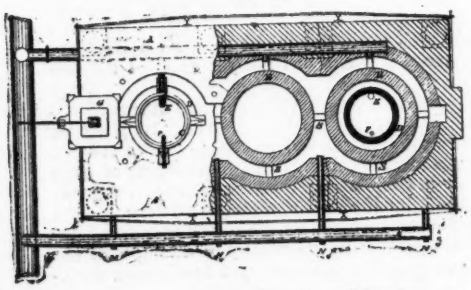


FIG 2.



The whole literature of the art, so far as it relates to the direct process, is, up to this time, but a history of failure. It is safe to say that more money, time, and talent have been fruitlessly spent in the pursuit of this object than in all the other unsuccessful efforts in the whole line of iron metallurgy. A distinguished authority in patent law has remarked that "the invention records of the United States and of foreign countries are filled with the waifs and abandoned relics of these abortive struggles."

Dr. PERCY, whose great work may be taken as an epitome of all that was worth mention, whether useful or curious, in pig iron metallurgy, up to the date of its publication (1864), after giving elaborate accounts of various attempts at the direct process, condenses his own opinion of all that had been then effected, into a brief but summary comment upon a pamphlet of one of the sanguine inventors who had said: "It is evident that the present mode of working iron ores, whether rich or poor, is not the most rational or economic one, although almost the only one in general use. They convert iron already malleable into cast iron, to be reconverted, at much labor and cost, into malleable iron again."

To this Dr. PERCY rejoins: "These questions are extremely obvious. They have been repeatedly proposed before, but never yet satisfactorily answered." Elsewhere he speaks of CHENOT (who came so near success that the jury of the French Exposition of 1855 thought he had attained it, awarding to him one of the great gold medals; and LE PLAY pronounced his invention "the greatest metallurgical discovery of the age") as "poor CHENOT," and ridicules the claims set up for him.

GRÜNER (in his *Steel and its Manufacture*, 1867, translated by LENOX SMITH, 1872), says: "Several metallurgists have thought that instead of smelting ores in a blast furnace, it would be better to simply reduce them to the condition of soft or carburized sponge. They hoped to obtain purer products and consume less fuel by operating at a lower temperature. They were completely deceived. When the sponges are made, instead of cast iron we have blooms of less purity, since they contain, besides the usual cinder, the earthy substances in the ore. And if the sponges are melted in crucibles instead of forging them directly in the form of blooms, we shall have a homogeneous product, but it will be iron or crude steel of inferior quality, unless the iron sponge undergoes fining like pig metal. In the direct methods whose object is the abolition of blast furnaces, the addition of carbon mixed with the ore cannot be avoided; and it is this which destroys all profit in the processes invented by CHENOT in France, RENTON in America, GÜRLT in Germany," etc.

BAUERMANN, who comes later than PERCY, (1868,) gives but slight attention to the direct process. Speaking of the various processes for the direct production of wrought iron from the ore, he says: "As these methods are only applicable to the treatment of easily reducible ores, and are essentially slow in work, giving only a small production from a plant of considerable extent, as compared with the open fire (Catalan forge), they have not as yet been found to possess sufficient advantages to be generally adopted on a large scale."

CROOKS & RÖHRIG'S work (1869), adapted from Prof. KERL'S *Metallurgy*, gives small encouragement. In the volume on iron they say, in their definition of wrought iron: "It is usually produced by the conversion of pig iron, and, in rare cases, is obtained direct from the ore." And again, under the caption, "Methods of Making Wrought Iron Direct from the Ore": "At present this process is seldom used on account of its numerous disadvantages. It requires pure, rich, and easily fusible ores, and is performed in interrupted operations; much iron is scorified. The consumption of fuel is very large, and lastly, the product is seldom uniform, and is mixed with slag, which can only be removed be repeated welding." After describing the Catalan forge, etc., they proceed as follows: "GERSDORFF roasts sparry iron ore in reverberatory furnaces, and heats the roasted ore, together with coal, in crucibles. CLAY heats ore and coal in a retort, and treats the reduced iron in a puddling furnace. RENTON reduces the iron ores in vertical, slightly-heated tubes, by means of carbonic oxide gas, and forms the reduced iron into balls in a puddling furnace. CHENOT submits the ores to a reducing roasting, to transform them into magnetic oxide, which he finely crushes, and by means of an electro-magnetic apparatus, extracts the magnetic components; he then reduces the ore with carbonic oxide gas, grinds the resulting spongy iron, mixes it with soda, presses it into cylindrical shape, and at a suitable temperature draws it out into bars. ROGER heats the iron, together with coal, in a rotating cylinder, and forms the balls in a puddling furnace." "None of these methods seem to have met with any practical success."

In their volume on steel, they say, under the heading, "Steel Direct from the Ore:" "GÜRLT proposes to treat rich, pure iron ore in cupola furnaces by means of carbonizing and reducing gases, and to melt the resulting product in a gas reverberatory furnace, but this method has not proved successful when carried out on a large scale. By CHENOT'S method, rich, pure ores are reduced in cupola furnaces by interstratified layers of charcoal; the resulting spongy products containing various amounts of carbon, are sorted and ground in mills, and the mass is pressed into cylinders and melted in crucibles, sometimes together with coal and a purifying and scorifying flux of manganese. This method has been tried in Belgium without economical success, and it does not permit the production of cast steel containing a fixed proportion of carbon." "The newest and most promising way of producing steel direct from the ore is Mr. SIEMENS' method with the regenerative gas furnace." This is the method described by Mr. SIEMENS before the Chemical Society of Great Britain, May 7, 1868. The main feature is the vertical hoppers in which the ore was to be reduced, and the product dropped thence into the bath of an open-hearth furnace. (Further o

* A paper read at the New York meeting of the American Institute of Mining Engineers, February 26, 1874.

we shall see that Mr. SIEMENS states that it has been abandoned.) Neither KÖHN nor FAIRBAIRN appear to have thought the subject worthy of serious notice.

Under date of February 27, 1869, we have the record of the opinion of a metallurgical chemist, known to you all as an eminent authority. I allude to Mr. GEORGE J. SNELUS. I quote from an English patent granted to him, of the date just mentioned: "In the ordinary process of making iron, the ore is reduced under such conditions that it immediately takes up carbon and is converted into cast iron. Several attempts have been made to produce wrought iron direct from the ore, but either owing to the process not being continuous, or its requiring too much time and fuel, or its inapplicability to the treatment of fine ore, and *the incomplete reduction* of the ore, none of these attempts have yet been successful in such a degree as to afford the means of making iron or steel so economically as can be done by first forming pig iron in the blast furnace."

On this side of the Atlantic, with one notable exception, the direct process received little attention in the literature of iron metallurgy. The exception I refer to is the report of Dr. T. STERRY HUNT, addressed to Sir W. LOGAN, Director of the Geological Survey of Canada, 1869. In this report the author says: "In accordance with the well known fact that the reduction of oxide of iron takes place at a temperature very much below that required for its subsequent carburization and fusion, it has been shown that the charge of ore in the blast furnace is converted to the metallic state some time before it descends to the zone in which melting takes place. It forms, when reduced, a spongy mass, readily oxidized, which, by proper management, can be compressed and made to yield malleable iron, or, by appropriate modes of treatment, may be converted into steel. This fact has been the starting point of a great number of plans designed to obtain malleable iron and steel without the production of cast iron and the employment of the processes of puddling and cementation. This, it is true, is attained in the Catalan and blooming forges, *but the attention of many inventors has been, and still is, directed to the discovery* of simpler, or at least more economical, methods of obtaining similar results."

Dr. HUNT then proceeds to sketch all the attempts at the direct process, in this country and abroad, worthy of mention, up to the date at which he wrote, pointing out in each case the difficulty or drawback developed in practical working. It is a brief but comprehensive history of the subject, and tells the same story in every case—failure to reach any large results.

The British Iron and Steel Institute may certainly be taken as embodying the latest and most advanced ideas in everything that relates to iron metallurgy. At its meeting in London, March 19, 1872, the discussion which arose respecting the Danks puddling furnace, brought out incidentally an expression of opinion on the direct process from some of its most eminent members. Mr. EDWARD RILEY said: "As regarded making wrought iron direct from the ore, he believed there was certainly very little hope of that being carried out practically or profitably. He thought no one could conceive any method more simple than the present process of throwing materials into the blast furnace for the purpose of reducing them, and he was sure that all improvements in iron should commence with the pig iron. They could make it in any quantity, and they ought to start there. He could not conceive of any other process of making iron cheaper."

Mr. ISAAC LOWTHIAN BELL "thought that a certain amount of disrespect had been shown"—in a previous part of the discussion—"with regard to the blast furnace, in speaking of it as a roundabout way of doing the work which was performed by it. There was no doubt that they combined the iron with the carbon or silicon in the smelting process, which had subsequently to be dispersed; but they must remember that the blast furnace, at the same time, got rid of earthy impurities generally found associated with iron ores. He therefore quite agreed with Mr. RILEY that, although it might be a roundabout way in the first instance, they could not conceive any means so simple for getting rid of a large amount of extraneous matter as blast furnaces."

These views appear to have been acquiesced in by the members generally. At their meeting in April, 1873, Dr. C. W. SIEMENS read a paper which, from the distinguished position of its author, and the character of its reception by his associates, may reasonably be supposed to represent the condition at that date of the art of iron making in Great Britain, so far as relates to the direct process. After describing the various attempts made by him to bring the direct process into practice, and explaining the reasons which induced him to abandon them, one after the other, he uses these words: "These experiments convinced me that the successful application of reduced ores could not be accomplished through their conversion into spongy metal, and fully explained to me the want of success which has attended the previous efforts of CLAY, CHENOT, YATES, and others, to produce iron direct from the ore." He then describes a new method and apparatus wherein he begins by abandoning one of the cardinal features of a truly direct process, a feature pointed out by Dr. Hunt in the extract I have already quoted, viz., that the reduction of the oxide of iron can be obtained at a heat much below that required for its consequent combustion and fusion. Dr. SIEMENS, despairing of realizing this feature, begins, in his new process, by fusing the oxide.

Such, I think, may be called a fair statement of the literature of the subject up to the present time. Furthermore, its uniform and consistent record of failure is borne out by the facts. It would have been, for example, impossible for a metallurgist so intelligent and deservedly esteemed as GRÜNER is, to commit himself to the statements I have quoted, if, at the time he made them, there had been in existence, as an article of manufacture on a large scale, a *true* iron sponge. He speaks of the "earthy substances" as causing "impurity," and says that the sponge when melted will, it is true, give a homogeneous product, but of inferior quality, "unless the iron sponge undergoes fining like pig metal." Had he been acquainted with iron sponge whose only "impurities" (in quantities sufficient to be objectionable) were silica and alumina, could he have fallen into the error of stating that the impurities could not be removed by the state of fusion, but only "when the iron sponge undergoes fining like pig metal?"

So with his statement that the necessity of adding carbon in the direct process "destroys all profit" in it. Had he been acquainted, I say, with true iron sponge, and familiar with its manufacture into iron and steel, he would have recognized the fact that in iron sponge we have the least possible affinity between the earthy substances and the metal. And he undoubtedly would have been thus informed had such practice been known in the art.

But setting aside all these, I come down to the present hour and present place, and our own country, and I ask you here present, who are familiar with all the industries of the nation, whether you have knowledge of any direct process for the production alike of iron and steel, now carried on upon a working scale, as a successful rival of the ordinary indirect methods?

When one considers that the immense results which must flow from the successful achievement of the direct process are understood by all scientific men, and have been by them so understood for years past, it seems like presumption to attempt to carry off a prize which all have hitherto either despaired of, or, seeking, have failed to win. It seems so plain, so easy, yet has still remained, as it were, just out of reach. There must be, one would say, some hidden but insuperable difficulty, else the problem had long since been solved. Consider for a moment how inviting a field it is. Nature provides us with the metal we want, chemically combined with oxygen, and mechanically mingled with other substances. Let us withdraw this oxygen from the iron only, leaving the rest as compounds, it alone being elementary. Now let us melt the product, so that the iron shall—simply by difference of gravity—be separated from the dross, and then poured into proper moulds. Here we have but two steps, each of great apparent simplicity—first, reduction; second, fusion. Such is the ideal, which by contrast makes the old system appear so crude, unscientific and roundabout, that the term "direct" applied to the new method sounds like the promise of a great and beneficent revolution.

We know that carbon at a certain heat will dissociate the iron and the oxygen, yet leave the other mineral matter of the ore unreduced, giving metallic iron—wrought iron—as the result. We know further, that we have at command furnaces in which the product can be melted down in a bath of cast iron, and so treated that it shall result in ingots of any desired degree of carburization. We know that if the reduction of the ore can be effected the elements of cost in fuel, labor etc., will make the product cheaper than pig iron, and also that the melting process is less costly than puddling, whereas its product is of far greater value. Why is it, then, that while the whole iron industry of the world is struggling by small economies to realize a return upon its capital, this most plain, most prominent of all economies remains unpracticed?

There has been a link missing—without it, all is naught. There has been no thorough, uniform, economical process of reduction. The missing link is true iron sponge. It is that which I come here to exhibit to-day; to tell you how it is obtained, and to show you that, by the means I shall describe, it is within the reach of all. Let me be your guide while we travel together, in thought, from the point at which I started to the final point of success. It shall not be the path I travelled. This time we will take the smoothest and shortest way.

We are in a chemical laboratory. We take a small porcelain tube and fill it with a mixture of pulverized peroxide of iron and charcoal; next we seal the ends of the tube hermetically, then expose it to heat, by immersing it in a bath of brightly red-hot sand for a cert in time (varying with the character of the ore), then take it out, cool it, and, after cooling, break it open, and pour out the contents. Carefully separating and testing them, we find that we have obtained particles of metallic iron. Now, what conditions did we observe to get this result?

First—There was contact of the iron oxide with carbon.
Second—There was isolation from the free oxygen of the atmosphere.
Third—There was the heat of bright redness.
Fourth—There was a certain duration of time.
Fifth—There was continued isolation from the air until cold.

Hence, we have established the fact that if a peroxide of iron be brought into contact with a sufficient quantity of carbon, with perfect isolation from the atmosphere while exposed for a sufficient length of time to a sufficient heat, and then cooled down to a sufficient degree while still isolated from the air, the oxygen and the iron will be dissociated, the oxygen passing off in a gaseous form, leaving the iron behind. Now, chemistry supplies all the data for filling up with absolute figures the blanks in this statement, and we have in consequence a formula by which, if strictly carried out, we *can* achieve the first of our two great steps in the direct process—we can gain the metallic iron directly from the ore. Hence the chemistry of the operation is clear, and it becomes simply an engineering question how to meet all the necessary conditions, so as to conduct it on the large scale.

First, we investigate previous attempts, striving to detect what is defective, recognizing what is correct, and supplying what yet is wanting. Proceeding in our course of elimination, we first reject all those methods in which it is sought to yoke the production of the iron sponge directly with a method of treating it; those, for example, which are meant to reduce the ore in one chamber and pass it as fast as reduced (or supposed to be reduced) into another chamber for after-treatment—welding, melting, &c. The operations cannot be made synchronous. One or the other must be disarranged in order to accommodate its fellow.

Confining ourselves, therefore, to the simple question of reduction, we finally give the preference, among the multitude of contrivances and appliances, to the vertical chamber, to be filled at top, and drawn at bottom, and working continuously. But in all these we discover one fatal defect: there is no adequate provision for the isolation of the material, either while under treatment, or while cooling, or both.

We experiment ourselves, and despair of obtaining the desired result by any arrangement of valves, or slides, or the like contrivances. The dilemma is this: we want an apparatus that, as I have said, shall work continuously and on a scale of considerable magnitude, taking in and discharging material at short intervals, yet always closed to the entrance of free oxygen. Or, otherwise stated, we must have a chamber so open at top and bottom that we can dump in a cartload of crude material above and draw out a cartload of finished product below, yet be all the time hermetically sealed against admission of air. Now this chamber—assuming that we have settled upon the plan of filling it with ore and solid carbonaceous matter, and heating them through its walls—must be surrounded by heat for a certain distance down and by a cooling medium below that, because we intend to reduce and then cool down. Well, we find that our difficulty as regards the keeping out of air at top, takes care of itself. The solid oxygen and solid carbon, down in the zone of reduction, are combining as carbonic oxide, and, by virtue of their great expansion, forcing their way upward and out so that they arrest every particle of free oxygen before it can penetrate downward. As to the bottom, however, we have not this resource, and must find another. We get it by giving to our chamber such proportions that there shall always be above the place of egress a column of material, so cool itself as to be proof against the influence of oxygen, and of such a height as to form a packing, which shall seal up all that material above it which has not yet reached the safe degree of cooling.

By this device, which, surely, is as simple as anything in metallurgical engineering, our dilemma is answered. We are now operating, in regular practice, at Glenwood, cylinders of three feet internal diameter, and forty feet in height, which are open tubes, so far as relates to the taking in and discharging of their contents, but as relates to access of air in their working zones, are sealed retorts; the seal above being the ingoing material itself and the gases percolating upward through it; and the seal below, the material which, by cooling, has become indifferent to exposure. For the first time, then, in the history of attempts at the direct process we have at our command complete isolation, yet continuous working.

Let us next take up the question of imparting and maintaining the necessary

heat. Here at once another difficulty confronts us. We must work upon a scale of considerable magnitude, and our reducing chambers must, therefore, be of considerable area. But their contents are very poor conductors of heat, and a little experience will convince us of the impracticability of getting an evenly-distributed temperature by conduction from the outside through a mass of, say, three feet diameter. Now, we must have uniformity of temperature to get uniformity of result, and the system we have adopted obliges us to impart the heat by conduction. We could conduct it, we will say, through three inches of the materials, in time enough to answer all practical purposes, but not through three feet.

Let us see, therefore, if we cannot bring every particle of the material within three inches of a sufficiently heated surface. Thus stated, you will probably guess at the solution of the problem. It is this: When charging your material into your cylinder, cause it to pass between heated surfaces in streams whose greatest distance in any part from a sufficiently heated surface shall not exceed your limit of three inches.

This, you will readily perceive, may be done in many ways. Let me describe to you one of the arrangements which I employ. It accomplishes very economically the purpose just explained, and performs another function which I will refer to directly.

In the top or mouth of the reducing cylinder, I suspend an inner cylinder or thimble of cast iron, with walls, say one inch thick, and having an outside diameter of 28 inches.

Now the reducing cylinder has an inside diameter of 36 inches; hence there is left an open space or annulus between the two of four inches across.

I charge my materials into this annulus only, so that all have to pass downward through it, and none can be more distant than two inches from the heated surface, either of the cylinder or of the thimble. I make the thimble long enough—say six feet—to insure that all the materials shall have acquired the temperature desired before they descend below the annulus.

This "initial heating," as I call it, establishes one of the primary conditions with which we started out—the imparting of the necessary degree of heat—the only duty required of that portion of the heating chamber which surrounds the cylinders below the level of the bottom of the thimble being to prevent the escape of the heat thus imparted. You will observe that this device completely meets the whole difficulty as to the conduction of the heat, so that—whatever the diameter of the reducing cylinder—it is only a question of what diameter and length you will give the thimble, in order to impart to your materials the temperature you wish.

We have now got thus far. Our reducing furnace shall consist of one or more cylinders (adapting the cylinder as the preferable form of chamber), which shall be heated externally for a certain distance, from the top downward, then cooled the rest of the distance downward to the base, excepting the room required at bottom for raising the telescopic sleeve for the discharge of material.

At its top is the thimble for initial heating.

Let us now revert to our original statement of the conditions to be met, and see if we have fulfilled them.

First—We provide the contact of iron ore and carbonaceous matter by mingling them before charging into our cylinder.

Second—We isolate these materials from free oxygen while in the zone of reduction.

Third—We conduct the required degree of heat through the mass.

Fourth—Our apparatus enables us to hold it under treatment for any length of time desired.

Fifth—We have continued the isolation until the product was too cool to be oxidized on exposure to the air.

Thus we have realized, upon a working scale commensurate with the requirements of the art, the laboratory experiment of the sealed tube, and the manufacture of iron sponge becomes as simple as any of the ordinary operations in the art of iron making.

From the general principles above laid down, it will be easy to plan a good working reducing furnace, but there are a number of details both of construction and management which I think may interest you.

I have already alluded to the thimble arrangement for the "initial heating" as having another recommendation beyond its convenient form. What I referred to is this: When the carbon dissociates the oxygen from the iron, carbonic oxide is formed, and this, rising as I have said, passes outward by way of the interior of the thimble, as furnishing a line of less resistance than the annulus, packed as the latter is with the ingoing materials. As it ascends through the thimble it is met by the air, which, in virtue of its greater weight (being colder), and from the tendency to transfusion in gaseous bodies, descends into the thimble, and a perfect combustion of the carbonic oxide is kept up.

Thus the carbon which had served as a chemical agent in the reduction of the ore, is made to do duty once more, and as a fuel.

Speaking of fuel, I would say that my method of heating the cylinders is to place the portion of them to be heated in a chamber of brick, which is supported on iron pillars; thus leaving the cooling zone accessible below. This chamber is heated by letting into it streams of gas at different levels, with an air inlet adjacent to each inlet of gas. All, of course, are arranged so as to have the gas supply under convenient control. Aside from the economy of gaseous, as compared with solid, fuel, it is incomparably easier to keep a chamber such as this at a uniform temperature with gas than to heat it by burning coal or wood on grates.

While on this subject of fuel I may say that I am tired of the ordinary form of gas producer. It is certainly a clumsy affair.

I hope to have something interesting to say, upon a future occasion, as to a better form throughout. Meantime I would suggest to others who find the clinkering to be as much of an annoyance as I do, to try—as I shall soon—in the present form of producer, a water-box all round, as high up as clinkers form, and water-bars like those sometimes used under boilers.

I not only introduce the gas into the heating chamber, but also carry a pipe into and project it downward nearly to the bottom of the thimble. By this means whenever the gases developed in the cylinders, as before explained, do not suffice to keep the heat of the interior of the thimble up to the point desired, I turn on other gas enough to make up the deficiency.

TO BE CONTINUED.

THE sensitiveness of the Scotch pig iron market is shown by the fact that a report that Messrs. ADDIE & SONS, of the Langloan Works, were about to damp down three furnaces was sufficient to affect prices, and when the report was authoritatively contradicted a collapse occurred. This is the more noticeable as there are 72 furnaces in blast in Scotland.

The Hocking Valley Coal Field.

PROF. T. STERRY HUNT has issued a pamphlet* of considerable size, in which the subject of Ohio coals, and especially of the Hocking Valley beds, is considered in their relation to metallurgical and other industrial developments. Our readers, who know Dr. HUNT's ability and thoroughness, do not need to be told that all the facts known about the fuels in Southern Ohio have been gathered and collated with care. The minuteness of his examination forbids any attempt to follow him without extracting too largely from the pamphlet. The area of the Hocking coal he estimates to be about 300 square miles, covering the greater part of nine townships. Though only an approximation based upon data which are still too general to permit conclusive results, he thinks this estimate is under, rather than over, the truth. Four workable seams of coal underlie this region, within a vertical thickness of less than 150 ft., the principal of which is the great bed corresponding to the Upper Freeport of Pennsylvania. It is mined in Ohio under the well known names "Straitsville," "Nelsonville," etc., and also more generally as the "Hocking coal," from its occurrence in the valley occupied by the river of that name and its tributaries. The author says of it:

"The Hocking coal, under which name we may conveniently designate the coal of the great vein throughout the Hocking Valley field, belongs to the class known as dry, free-burning, or non-caking coals, which do not soften or run together in burning. * * * [It] is laminated in structure, with the characters of a splint coal, and burns with a bright flame, which is, however, less voluminous and smoky than that of cannel. It swells lightly, but instead of forming a cohering mass, breaks up, and gives a body of glowing coals, which resemble those produced in the combustion of hard wood. Numerous analyses of this coal, from various parts of the field, show it to be unusually free from sulphur, with a proportion of fixed carbon, varying from 56 to 60 per cent., and a comparatively small amount of ash. Its consumption, in 1873, amounted to considerably over a million of tons, and it is largely used as a steam coal, both in locomotives and steamboats. It is also very favorably known as a fuel for puddling furnaces and rolling mills, and, in fact, for all ordinary purposes."

This coal is used in blast furnaces at Columbus and Zanesville, smelting ⅓ native carbonates and ⅔ Missouri or Lake Superior ores, with about 75 bushels of coal. After discussing the Briar Hill coal, Dr. HUNT passes to an account of the iron ores found in the Hocking valley. These are limonites and carbonates, the former yielding 50 to 55 per cent., and the latter 40 per cent. in the furnace. Purchased ores cost $3 to $5 a ton, but the carbonate ore, mined by the Latrobe Company and delivered at the furnace, cost, in 1872, $2 71 per ton of 2,240 lb. In Gallia County, the cost of mining and delivering is $2 50. In addition to these two kinds of ore, Dr. HUNT found a third, not recognized in the reports of the Geological Survey. This is a red hematite in nodules distributed through a layer of soil. It seems to be quite pure and rich, and, if found in sufficient quantity, may become a very important source of iron. The amount of ore in the Hocking region is shown to be very large and probably enough to last out the supplies of coal.

An interesting part of this pamphlet is the estimatad cost of producing iron at various points, which we tabulate as follows:

	Ore.		Coal.		Limestone.		Labor.	Interest, etc.	Total.
	Tons.	Cost.	Bush	Cost.	Tons.	Cost.			
Jackson Co.....	2½	$6 88	60	$2 70	¾	$0 75	$3 00	$2 00	$15 33
Pittsburgh—L. S. ores and coke.....	1⅔	18 75	80	6 40			8 00		33 15
Do.; Smelting with owner's coke.....	....	18 75		5 20			8 00		31 95
Cleveland—L. S. ores and Connellsv'e coke	1⅔	15 00	80	9 75			8 00		32 75
Cleveland—Briar Hill coal.....	1⅔	15 00	56	9 56			8 00		32 56
Hocking Valley—L. S. ores and raw coal...	1⅔	18 33	75	4 50			8 00		30 83
Do.—Native ores.....	2½	7 50	60	3 00			8 00		18 50

Dr. HUNT concludes that iron can be made in the Hocking region for $16 to $18 a ton, and possibly for still less.

We have not been able to copy the numerous tables of analyses, which are valuable and minute. For them, and for the concise and lucid discussion of the subjects which come under the author's notice, we refer to the pamphlet itself. Two large maps add to its usefulness. It is in every respect a timely contribution to our knowledge of Western fuels.

Long's Patent Hot Blast Stoves.

ABOUT a year ago the Blast Furnace Erection Co., of Pittsburgh, built one of these stoves for Messrs. JAMES WOOD, SONS & Co., of Pittsburgh, but as the company blew out its furnaces about that time, there has been no opportunity for testing the efficiency of this method of heating the blast. We learn that Messrs. KIMBERLEY & Co. have leased and blown in the above mentioned furnaces, and a trial is to be made, in a few days, to determine the relative economy of Mr. LONG's stove. We hear it highly spoken of by those who have examined it, and will note with interest the results of the experiments.

* The Coal and Iron of Southern Ohio considered with relation to the Hocking Valley Coal Field and its Iron Ores; with notices of furnace coals and iron smelting, followed by a review of the coal trade of the West. By T. STERRY HUNT, LL.D., F.R.S. Published by the Naturalists' Agency, Salem, Mass. 1874. Price 50 cents.

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., JOHN A. CHURCH, E. M., } Editors.
RICHARD P. ROTHWELL, C. E., M. E., Editor of the Coal and Iron Department.

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It is the Official Organ of the American Institute of Mining Engineers, and it alone publishes the valuable papers read before that influential society.

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THE telegraphic news of a severe fire in Central City, Colorado, made a good many eastern men, who know how closely the western towns are built around the mines, feel decidedly blue, and have a vivid presentiment of coming assessments. Fortunately the damage, though severe, was mostly confined to buildings not immediately connected with the mines. The business part of the town was burned, and the loss, which was about $600,000, mostly uninsured, is said to have covered nearly three-fourths of the property valuation of the city. The mishap, though trying, will not be altogether unfortunate. Fire, while a destroying, is also a purifying agent, and purification rarely comes amiss to a western town. The burnt district, being entirely within the city limits, will be rebuilt in brick and stone, a regular system of streets will be laid out, and Central City will profit materially by its trials.

LADY professors of chemistry are not such common birds as the other kind, and when one of them comes forward to take her stand among the practitioners of the profession, she must expect to excite as much interest as solitary women usually arouse in a crowd of men. We, therefore, print the following letter from Prof. RACHEL L. BODLEY, of the Women's Medical College of Pennsylvania, addressed to Dr. CHANDLER : "Dear Sir—I am a subscriber to your excellent journal, the *American Chemist,* and had therefore read in its columns the 'Centennial of Chemistry,' which reached me this morning in the shape of a circular. Thanks for this generous recognition of a lady professor of chemistry. At the moment, I was enveloping to you a copy of a valedictory address, in which I referred to the centennial year of chemistry. Now, for my suggestion as to a locality for the proposed celebration. I made a pilgrimage, last August, to the grave of Priestley, in Northumberland, Pa., and was deeply impressed by the locality, its associations, and its charming surroundings; my proposition is, therefore, that the centennial gathering be around this grave, and that the meetings, other than the open-air one on the cemetery hill-top, be in the quaint little church built by Priestley, where might be exhibited the apparatus devised by the great scientist, and used in his memorable experiments. I need not remind you how convenient this locality is to the route of summer tourists, and how centrally located for those coming from the west, as well as for those residing near the seashore. . . . ."

The Institute at St. Louis.

THE St. Louis meeting has been one of the most extended which the Institute of Mining Engineers has ever enjoyed. On Wednesday evening the Hon. THOMAS ALLEN, President of the Iron Mountain Railroad and founder of the Mining Department in Washington University, made an address to the members present, to which Mr. RAYMOND, President of the Society, responded. Some papers were also read at that time, and on Thursday three sessions were held. Friday was given to an excursion to the famous Mine La Motte, the night being passed at Iron Mountain. On Saturday that remarkable deposit of iron ore, and also its neighbor, the Pilot Knob Mine, were examined. Monday was spent in a visit to the St. Louis Refining and Smelting Works at Cheltenham, the blast furnaces at Carondelet, the coke works at East St. Louis, and other points of interest in the immediate neighborhood of the city. That was a busy day, for on Monday night the members started for the Indiana Block Coal field, and were to spend Tuesday and following days in an inspection of that interesting region. This is the record of a busy meeting, and it shows how well founded was the choice of St. Louis as the place for holding the fourth annual meeting. Its distance from the Atlantic proved to be no hindrance to Eastern and Middle State members, of whom more than a score were present. It is gratifying to find forty new members elected. We can safely congratulate the members upon the steady advance of the Institute in strength and influence. The interest manifested in its proceedings is shown by the remarkable number of papers offered for its consideration. At the New York meeting more than twenty were presented, and at St. Louis the number was nineteen.

Phosphorus and Carbon in Iron and Steel.

WE have not space enough to reproduce in our columns the address of Hon. THOMAS ALLEN and the somewhat extended reply of Mr. RAYMOND, as President of the Institute of Mining Engineers, with which the St. Louis meeting was inaugurated. But the following portion of Mr. RAYMOND'S remarks should be preserved, as a timely piece of information, upon a subject of considerable importance. It refers to the law, said to have been discovered at the French works of Terrenoire, that the amount of phosphorus may be increased without injury to steel, if the amount of carbon be proportionately decreased. The works named have been for more than a year, it is said, manufacturing by the Siemens-Martin process, steel rails containing as high as 0.35 per cent. of phosphorus, with about 0.15 per cent. of carbon, which were not found inferior to Bessemer rails. It is not claimed by the manager of the works that phosphorus is an ingredient to be preferred, or purposely introduced ; but only that materials containing it (such as old iron rails, etc.) can be successfully employed. Other parties have apparently a higher opinion still of the new manipulation, and are prepared to claim for "phosphorus steel" superior qualities. Mr. I. LOWTHIAN BELL attended to the subject in his recent address as President of the British Iron and Steel Institute, but without expressing a positive opinion.

After pointing out that the commercial value of the process turned on the cheap manufacture of ferro-manganese, by means of which only could the necessary amount of manganese be introduced into the Martin bath without increasing its content of carbon, Mr. RAYMOND proceeded to say that the principle alleged to have been discovered at Terrenoire was already known years ago, in this country, at least. Not only had steel been manufactured here, containing high percentages of phosphorus, coupled with low percentages of carbon, and suitable for use in rails, boiler-plates, etc., but the reason of its surprising qualities had been distinctly surmised, if not widely proclaimed. The following analyses and extracts from private letters prove these assertions. Some of them assert a similar principle in the case of wrought iron ; but the analyses, and the remarks based upon them, have reference solely to the steel manufactured under the superintendence of Mr. SLADE, at the works of the New Jersey Steel Company in Trenton.

Analyses of three charges of excellent quality of soft "Martin steel," *used for boiler plate.* March 15, 1870.

	No 214.	No. 168.	No. 167.
Carbon	.160	.120	.120
Sulphur	.003	.008	.007
Phosphorus	.153	.113	.275
Manganese	.144	.058	.072
Silicon	.174	.015	.025
Date of melting	Dec 29, '69.	Oct. 20, '69	Oct. 19, '69.

Extract from letter from C. P. SANDBERG, London, May 23, 1870, to FRED. J. SLADE : "I have with great interest read your letter to *Engineering* about steel (Siemens), and beg to say that I fully agree with you in many respects. One thing, however, astonishes me, viz.: the large percentage of phosphorus of 0.12, 0.15, 0.27 per cent. Whatever could you make of such steel? Certainly not boiler plates, and I should be afraid to use it for rails even. BESSEMER says 0.05 per cent. is as much as he can possibly manage in the pig or in the steel."

Additional analyses, June 20, 1870—Steel melted Nov. 26, '69 (remarkably tough):

No. 272.		No. 191.			
Carbon	.125	Carbon (boiler plate)	.120	(Bar)	.210
Phosphorus	.314	Silicon "	.052		
		Phosphorus "	.272		

Extract from letter from J. BLODGETT BRITTON, Phil., June 23, 1870, to FRED. J. SLADE : "I have examined a number of irons and mild steels (have frequently been puzzled to tell the difference), but in most cases the samples came without any collateral information, unless verbal, or in a form I cannot now quote. I made quite an extended examination of some of the Welsh rails that were first laid in this country. Some of them were in use 28 to 30 years, and when taken up were worked into axles and bridge rods, because of their remarkable toughness and strength; they contained from 0.294 to 0.385 per cent. of phosphorus and about as much silicon. It was long ago asserted by KARSTEN, you will remember, that bar iron might contain as much as 0.50 per cent. of phosphorus before showing cold short qualities, and up to 0.30 per cent. the only effect was to give hardness, without affecting tenacity. But unfortunately *he did not add how much carbon might be present.* I have thus endeavored to answer your questions, but fear very unsatisfactorily. I hope you will go on with your experiments and writings, and if I can assist you I will."

Extract from letter from same to same, March 8th, 1871: "Phosphorus exerts a marked influence upon the metal when associated with carbon, the more carbon

the greater relatively the influence causing brittleness and frangibility at ordinary temperatures, when in the slightest excess. The substance is nearly always present. If not relatively in excess it does not appear to be hurtful. Thus I have found 0.30 per cent. of phosphorus with 0.06 per cent. of carbon, and 0.08 per cent. of phosphorus with 0.20 per cent. of carbon, and in metals that were claimed to be very good."

Extract from letter from A. S. HEWITT to EDWARD COOPER, dated London, August 3d, 1869: "There is one other matter of equal importance. It seems to be settled that heads of rails wear better if the iron contains phosphorus, but is otherwise pure, that is, free from sulphur, and puddled so that there is no carbon left in the puddled ball. This is the key to the good iron rails made in Wales and in Westphalia. Heads that are to be made hard with carbon (puddled steel) should be free from phosphorus, and heads that are to be made hard by phosphorus must contain no carbon or sulphur (in order to insure welding) and no silica (in order to insure sufficient tenacity). At Dowlais, if there is the slightest trace of carbon in the flame of the puddled ball, it is sent back to the furnace, but the pig used is expressly made from ore containing phosphorus. In other words, it has been ascertained that iron containing phosphorus, but free from other impurities, is *good for wear* and next best thing for heads of rails to steel."

Mr. SLADE says of these data: "The charges, the analyses of which are here given, were not exceptional, but are samples of our regular working we having made several hundred tons of similar character. The letters from Mr. BRITTON were in reply to questions which I asked of him, suggested very probably by the foregoing letters from Mr. HEWITT and Mr. SANDBERG. The analyses were made by him, and were desired partly to throw light on the same subject."

Nor were the works at Terrenoire the first to use ferro-manganese in the manufacture of soft steel. This was a subject much discussed about 1866, the only difficulty being the cost of the ferro-manganese. In that year, Mr. SLADE applied to both Mr. HENDERSON and Mr. PRIEGER (whose patents the Terrenoire works subsequently purchased) to ascertain on what terms the article could be obtained. Neither of them were then making any; but Mr. SLADE purchased of the Lancaster Steel Works for the Pennsylvania Steel Company a few tons of HENDERSON'S ferro-manganese, which was all that he could find in the English market. These facts seem to settle the question of novelty, in anything but the purely commercial aspect of the case.

So far as that aspect is concerned, it is doubtful whether the margin of difference between Bessemer pig and old rails leaves room for the employment of ferro-manganese so as to make steel rails by the Siemens-Martin process in this country that can compete in price with Bessemer rails. The price of old rails is regulated by the bar-mills to such an extent that it is not likely to fall below a certain interval from the price of pig iron. At present, Bessemer pig can doubtless be had at $45; and old rails are worth perhaps $40. If the cost of ferro-manganese is to be even but 25 cts. per pound (the smallest sum yet hinted) the prospect is not specially encouraging. Whether anything can be done by the proposed process in the way of converting phosphoriferous pig into serviceable steel, it would be premature to inquire. The practice at Terrenoire has dealt, it is understood, with old rails wholly or chiefly.

These remarks are the more appropriate, since M. TESSIÉ DE MOTAY already claims as his own the invention of the phosphoriferous steel process; and a dispute appears to be pending abroad on the subject; while at the same time a foreign company is proposing to introduce the patents into this country. It may be well for American iron masters to know that whatever is the value of the new process, it is not a new invention.

The Condition of the Iron Trade.

THE continued depression in the iron trade which our market reports have chronicled from week to week for many months, is due in part to the general prostration of business which followed the financial panic of September last, and in part to the fact that our production, under the stimulus of abnormal prices and enormous profits, has not only overtaken but even excelled our consumption of iron. It is natural that our furnace owners should be loath to lose even a portion of the large dividends they had been making; but long before September last it was quite evident to every thinking man that the market was being overstocked, and that our prices must be greatly reduced. This action was inevitable. The panic merely concentrated within a few months results which otherwise would have extended over a longer space of time. The fall in the price of iron in Europe was in no measure the cause of the depression in our trade, though it would effectually prevent any return to the enormous prices of two years ago.

The remedy for existing difficulties was the subject under discussion at the meeting of some forty pig iron manufacturers in Philadelphia, on the 28th of May, and the following resolutions were adopted:

Resolved, That we earnestly appeal to Congress for such legislative assistance to the industries of the country as will aid in relighting the fires which are now quenched, and in giving employment to our unemployed workingmen.

Resolved, That it is the opinion of this Convention that this assistance can be most promptly rendered by stimulating the completion of the present authorized continental lines of railroad between the Atlantic and Pacific, and by improving and increasing the facilities for cheap transportation by water for the traffic of the country, thus giving employment to our mines and furnaces and rolling mills; giving a fresh impetus to the development of the resources of the country, and imparting new energy to every fibre of the national life.

Resolved, That not only would these results be obtained, but the completion of these continental lines of railway would effectually end our Indian troubles in a manner consistent with our civilization and the duties it devolves upon us, and thus save millions annually to the Government in military supplies and transportation.

Resolved, That the permanent prosperity of the industrial interests of the country can only be assured by the speedy adoption by Congress of a financial policy which shall produce a general revival of confidence and by the abandonment of the suicidal policy of encouraging foreign manufactures at the expense of our own capital and labor.

Resolved, That this Convention earnestly recommends the passage of the Finance bill now pending before the House of Representatives, providing for free banking, believing that either that or the Senate bill will go far towards affording the relief which the country now so urgently needs.

Resolved, That as the interests of labor and capital are identical, the workingmen of the country should arouse and apply themselves to obtaining that relief from Congress which is now made necessary by the great depression in all branches of manufactures.

Resolved, That we request the working classes of this country, through their organizations and otherwise, to call mass-meetings immediately, and urge upon the present Congress not to adjourn until it has acted upon the financial questions before it, as well as upon other measures, the adoption of which will tend to reëstablish confidence and infuse new life into the industrial interests of the country, thereby averting want and suffering during the coming Fall and Winter.

Resolved, That we will coöperate with the workingmen to the best of our ability in all honorable means to have proper action taken by this Congress or the next to avert the threatened influx of foreign iron into this country, by which action the labor necessary to the production of such iron as the country needs will be secured to our own people, to whom of right it justly belongs.

Resolved, That it is fatal to our interests to longer attempt keeping our furnaces in blast, as at the present prices paid for labor the loss in the manufacture of pig iron is large, and if stocks accumulate much beyond the wants of the consumers this loss will be increased and bankruptcy will be inevitably reached; as a measure of self-preservation, therefore, we recommend all the manufacturers of pig iron in this country to curtail production by stopping the mining of coal and ore, and such other work as is necessary in the preparation of stock, and by putting out their fires as soon as possible, until such time as demand will justify a change of policy.

Resolved, That we reaffirm the resolution adopted by the American Iron and Steel Association at its meeting on the 20th of November last, as follows: That we regard the power given to a single creditor under the present bankrupt law to force a debtor into bankruptcy against the will and to the injury of all others having claims upon the estate, as unjust in principle and disastrous in practice, and in the opinion of this association the law should be so amended as to give to three-fourths of the creditors in interest the right to control the settlement of the affairs of an insolvent, and to prevent them from being subjected to proceedings in bankruptcy.

We know that to a large part, we believe the great majority, of our best informed iron manufacturers, as to ourselves, these resolutions appear exceedingly weak, not to say absurd. They do not at all meet the case or suggest a reasonable remedy for our difficulties. Which of our iron manufacturers *believes* that an increase of 70 cents per ton in import duties would help the present market, and which of them *believes* that the country should be saddled with other huge jobs, like the Union Pacific Railroad, and have to pay, in the present condition of trade, forty or fifty thousand dollars a mile for these roads in the wilderness, in order that our iron manufacturers may be able to find sale for say 100 tons a mile more of their iron?

This frantic appeal to Congress for help, on every occasion when trade is dull, is quite unworthy of our intelligent iron masters. And now that it is well known that we are not importing, nor are likely for some time to come to import, any considerable quantity of foreign iron, this calling up the bugbear of "the threatened influx of foreign iron" cannot fail to make these resolutions appear ridiculous, and injure the cause they are intended to assist.

Let our iron masters leave off these spasmodic appeals for national charity, get down to business and help themselves.

We must extend our markets. The ultimate ambition of our patriotic iron masters surely cannot be to supply only our own people; and, if it were, the absolute prohibition of the import of foreign iron would not relieve them from that competition in prices which is really the great grievance.

Even including the prodigious development of our railroad system, the consumption of iron, *per capita*, in this country is far below that of England. We must increase that consumption at home, and we must seek a foreign market for our surplus. In other words, we must make and sell our iron cheaper; this is the only remedy that can bring about a permanently healthful condition of our iron trade, and there is no use closing our eyes to the fact. We must admit the fact that we have to make iron cheaper, instead of invoking temporary expedients to help us to get prices which will enable badly located and wastefully managed works to make money.

Our furnaces cannot afford to pay the present prices for ore. No furnace can possibly make iron at a profit on the prices we now have, and are going to have for a long time to come, when paying $10 and $15 per ton for its ore. Royalties of $1 and $1 50 per ton for ore in the ground are too high. In some instances the price of coal is excessive, but it is rather in the amount of coal we consume than in its price that we must economize. Why should we use over two tons of anthracite in our best Lehigh furnaces to produce a ton of No. 2 iron, when 22 cwt. of coke suffice for the same work, with even poorer ores, in some of the English and continental works? We have never paid that attention to economy in the working and management of our furnaces, which the present condition of metallurgical knowledge demands, if we would compete in the markets of the world. Transportation on both the raw material and manufactured iron is much too high, and those works which have been built at points where the conditions of cheap production and cheap access to market have been ignored, must suffer the penalty which follows injudicious investment in any other branch of business. Wages must be reduced in every branch of business, though there is less chance of any important saving in that particular to our pig iron manufacturers than there is in some of the items above mentioned.

Let us go to the very foundation and build up a business that can stand a foreign competition. We can make iron in many parts of this country as cheaply as they can in any part of the world, and we must study closely every item of cost by the light of the experience of others as well as ourselves, and bring to the management of our works that thorough technical knowledge, intelligence, and good judgment which can give us at least equal advantages with the manufacturers of other countries.

CORRESPONDENCE.

The Composition of Bessemer Pig.

TO THE EDITOR—SIR: I have just noticed in your Journal of the 23d ult., an inquiry for a report of an analysis of pig iron suitable for making Bessemer Steel, especially with reference to the percentages of sulphur, phosphorus and silicon allowable therein, and I send herewith a statement of the proportions of those elements contained in a number of samples of well tried Bessemer pig of different makers.

The Bessemer Process has so commended itself to metallurgists and chemists as one whose phenomena challenge their fullest investigation, that in certain aspects it has ceased to be a private matter controlled by the owners of the patents under which it is conducted, and has become so generally recognized as a branch of the metallurgy of iron that investigations and improvements go on as independently in it as in blast furnace practice, the puddling process, or any other metallurgical process now in use.

Hence it is that information governing its profitable conduct is more or less the acquisition or discovery of investigators and workers independent of the patentees, and may or may not be contributed for general information.

Just what kind or mixtures of pig irons will make the best Bessemer steel are not likely to be published by the parties using them.

The main features of the process, and the conditions most necessary to its successful conduct have been repeatedly and very fully set forth during the past ten years in the columns of the metallurgical and chemical journals of this country and of Europe, and improvements of all kinds are by such journals generally promptly chronicled. Indeed, it is greatly to the credit of these journals and of many of the enthusiastic scientists who contribute thereto, that those who are most directly interested in the Bessemer process find it necessary to be close readers in order to be fully posted in their own business.

The process being conducted the world over, we are all, to a greater or less extent, dependent upon such agencies as yours for information as to new developments, and the conditions and extent of production by the process are constantly changing.

When the Bessemer process was first introduced into this country, it is true, as stated by you, that two hundredths of one per cent. of phosphorus and about one tenth of one per cent. of sulphur were considered desirable limitations of those elements in the whole charge of metal converted; and in those days a product of fifty tons of ingots per day would have been considered large.

Now-a-days, our steel makers have learned so to mix different makes of pig iron, and to prepare the alloys used in the process, that pig irons containing fully the twelve-hundredths of one per cent. of phosphorus, stated by you as a margin, can be safely used to a large extent, and the difficulty with sulphur is correspondingly reduced.

Besides, a product of one hundred and fifty tons of ingots per day attracts no more attention now than fifty tons did four or five years ago.

It is safe for makers of pig iron to assume that for use, in the Bessemer process, the *less phosphorus, sulphur and silicon their iron contains the more valuable it will be*, since all those elements are contained so generally in the commoner grades of iron that it is easy enough to reduce the quality of good irons by adding poor ones.

Any maker of Bessemer steel who can get one-half or more of his pig iron absolutely free from phosphorus, can use, of course, for the remainder iron containing more phosphorus than the limit for the average of the charge; and iron, otherwise good, which contains as high as one-fourth of one per cent. of phosphorus, may be saleable for Bessemer use to a moderate extent.

The presence of both phosphorus and sulphur in the same iron cannot be suffered to the same extent in which either may be used alone; for, though their effects upon the product are quite opposite, the evils seem to intensify each other.

Sulphur bothers the manufacturer of steel more than it does the user of the product, since its tendency is to make the product brittle when hot, and thus prevent its being worked economically. Phosphorus, on the contrary, affects the quality of the finished product rather than the manufacture, and this is the more dangerous and objectionable, as its effects have sometimes been confounded with the natural hardness and brittleness of the older makes of steel.

I have made steel experimentally for interested parties from pig metal, the subsequent analysis of which showed it to contain eighty-eight hundredths, or nearly one per cent. of phosphorus, sample ingots of which steel hammered and worked beautifully when above a low red heat, while the cold product was as brittle as glass.

Sulphur and phosphorus combined to any considerable extent in a mixture of pig iron for making Bessemer steel effect a general rottenness in the product, as the tendency to neutralize each other which has been claimed when pig irons containing them are puddled together into iron, is not found in the Bessemer process.

As regards silicon, so far as I have found or learned, it has an incidental rather than a direct relation to the manufacture of Bessemer steel; and, with the general abundance of silicious pigs normally produced, no one need prepare for the manufacture of such.

Silicon is rapidly oxydized and turned into slag in the converting process, and consequently any large percentage in pig iron converted would be all loss were the iron otherwise suitable for the Bessemer process.

It frequently, however, happens that pig irons do not contain enough carbon to develop, by its combination with the air forced in during conversion, sufficient heat to make the resulting steel fluid enough to be cast easily; and then, as silicon, when oxydized, generates a more intense heat than carbon, silicious pig mixed with the lightly carburized iron will remedy the difficulty. All pig irons contain more or less silicon, but it is quite common to use irons for mixtures in the Bessemer process, which contain as much as three per cent. of this element.

Whether pig iron is made with charcoal, with hot or cold blast, and various other considerations, to a considerable extent affect the results produced from it by the Bessemer process, and beyond the simple fact that iron for this process is worth more the less phosphorus, sulphur and silicon it contains, and is scarcely useful at all for mixtures if it contains more than one quarter of one per cent. of phosphorus, or but very little more sulphur, there cannot much be learned except from the makers of Bessemer steel individually, whose special circumstances dictate the special selections of irons for their operations.

The list of analyses which I give below contains the percentages of carbon, sulphur, phosphorus and silicon which have been found in different makes of first-class irons for the Bessemer process, and I hope they will, with the foregoing general explanation, give your correspondent the information he desires.

With regard to the development the manufacture of Bessemer steel has had under the enterprise of American manufacturers, I will state that Messrs. JOHN A. GRISWOLD & Co. and the Cambria Iron Co. have each made between 950 and 1,000 tons of ingots in a single week from two five-ton converters, involving the conversion of 1,100 tons of metal, while the North Chicago Rolling Mill Co. has just converted, in the month of April, from two five-ton vessels, the unprecedented quantity of 4,021 tons of metal, equal to 3,400 tons of ingots of steel, or at the rate of over 40,000 tons of ingots per year.

The other American works in operation are rapidly approximating to this practice.

CONTENTS OF CARBON, SULPHUR, PHOSPHORUS AND SILICON IN BESSEMER PIG IRON.

	Graphitic carbon.	Combined carbon.	Silicon.	Sulphur.	Phosphorus.
1	3.082	1.265	1.389	.068	.027
2	2.952	1.235	2.286	.075	.055
3	2.997	1.134	2.706	.068	.028
4	3.31		1.86	.071	.076
5	3.928	.109	2.64	.004	.014
6	3 527	1.012	.854	.010	.031
7	3.180	.750	1.960	.018	.040
8	3.03		1.60	.08	.053
9	3.046		1.76	.04	.04
10	4.007		1.752	.00	.046
11	3.40		1.90	.027	.049
12	2.24		2.77	.01	.05
13	3.22		3.02	.00	.06
14	3.47	.31	2.97	.16	.051

Yours respectfully,
Z. S. DURFEE.

NEW YORK, May 25, 1874.

The Comparative Trial of Rock Drills.

TO THE EDITOR—SIR: In a recent number of your esteemed Journal I noticed an abstract from a report made by Mr. GEO. H. REYNOLDS on a trial of Rock Drills at Mineville, N. Y.

Permit me to call attention to a few facts which I observe not to be shown in their proper light.

1st. The report would show that the trial commenced with a 2¾-inch cylinder Rand drill against a 2½-inch cylinder Ingersoll drill.

I beg leave to state that this is an error, for the trial commenced on Monday, the 13th of April, with a 2½ Rand drill and a 2½ Ingersoll drill, but on the first hole drilled by the Rand drill the steam chest and chuck bolt were broken. It was then sent to the machine-shop and replaced by a 2¾ drill. It would appear from the report that the 2¾ drill was the only one used that day. This is a very important item, for with three rock drills and only one running, it is a very easy matter to exhibit a good report from that one, for in case of a breakage, as in the commencement of this trial, another drill could be substituted for the broken one.

2nd. The size of the pipe leading to the drills should be mentioned, as this is a very important matter. The Ingersoll drill received air through 100 feet ¾-inch steam hose, and from 200 to 400 feet 1-inch steam pipe. The Rand drill received air at a less distance and through 1¼-inch hose and pipe direct to the machine. I call attention to this fact particularly, as so great a disparagement in size of pipe necessarily makes a great difference in the running of the machine.

The reason of this is obvious. The friction in transmitting air power through small pipe is much greater than when larger pipe is used; also, the ice which accumulates on the inside of the small pipe becomes loose and is driven forward towards the machine, thus obstructing its movement and causing it to run irregularly.

The test made with the air gauge sustains this fact, although it is not mentioned in the report. The air gauge, when applied to the Rand drill, exhibited a loss of only 5 pounds, and run steadily, while its application to the Ingersoll drill exhibited a direct loss of 10 pounds, and constantly fluctuated from 60 to 20 pounds.

3rd. The Ingersoll drill was worked in a part of the mine difficult of access, and so dark, that it was necessary to use lamps in order to work the machine to any advantage; while the Rand drill was placed in a part of the mine easy of access, and light enough to render the use of the lamps unnecessary. This would also give the Rand drill a great advantage over the Ingersoll drill, for it is much better working a machine in the light than in the dark.

4th. The men who handled the Ingersoll drill were unskilled in its management, having but five days' experience in its use before the commencement of the trial; while with the Rand drill the men, under the instruction of a skilled operator, had at least four weeks' experience. This, with the difference in the location of the mine where the drills were worked, would make, at least should make, a great difference in the general result.

5th. The note of repairs would seem to be for one Ingersoll drill during the trial of two weeks only, and these taken from memory, while with the Rand drill it would seem that there was an accurate account kept of all repairs.

I beg leave to call attention to the fact that the list of repairs on the Ingersoll drill is correct, but instead of being for the one drill on trial for two weeks, covers all repairs on both the drills. I had two drills at the mine from the commencement, one beginning work on the 4th of April, the other on the 7th of that month, and both drills working until the 1st of May.

As to the Rand drill, it would seem that an accurate account has been kept of repairs as they were made; but at least one error is apparent, as no mention is made of the steam-chest and chuck-bolt broken on the 2½ Rand drill on the 13th instant.

6th. It is particularly mentioned in the report, that on the first trial of the Ingersoll drill, the bits were specially prepared for the occasion. It should also have been stated that through the fault of the operator he had failed to adjust the lower air chest of the machine, and for that reason it did not work as fast as it ordinarily should. It is also stated that, in the second trial, the bits were in fine order. This remark is unfair, for the bits were the same that had been in general use in the mine.

7th. In the record of dry holes, is shown that the Rand drill was 48 minutes, 55 seconds drilling a hole 4 feet 9 inches deep. The time is correct as to the drilling, but the report fails to state that they could not get the last steel out of the hole until three men had worked 35 minutes 20 seconds. This

should have been added to the 48′ 55″ making 84′ 55″ total time to finish the hole ready for blasting.

The report also does not mention the fact, that the Waring drill failed on its first trial of this dry hole. Had it mentioned this and shown the character of the drilling, any person could have seen that to drill a hole of this description depended more upon the men than upon the machine.

8th. It should also be shown in the report, that there were three Rand drills at the mine, and only one working at a time. That when one had been run a day, it was placed in the hands of a machinist to be overhauled and put in repair, and another put in the mine and run during this interval. Any person cannot fail to see that this gives an advantage of three drills to one.

As a further proof of my confidence in the Ingersoll drill, I hereby offer a challenge to any parties interested in rock drills, to put the same sized cylinder at work on Jersey Trap Rock for 30 days. The drills to receive steam from the same engine, and through the same sized pipe and connections. There shall be a competent, reliable and disinterested person to give the full result of this trial. And unless I show at the end of the 30 days that the Ingersoll drill is superior to any other in the market, I will defray the full expenses of the trial.

But if I do show a superiority, then the competitors shall defray their own expenses.

In conclusion, I have to say, although the Ingersoll drill was worked under the disadvantages of a dark and difficult location and unskilled labor, receiving pressure through 500 feet 1-inch, and 100 feet ¾-inch delivery pipe to our competitors' 1¼-inch, the result shows an average of 1 6-10 and 1 7-10, to 1 9-10 and 1 7-10. And I am confident, had the Ingersoll drill been worked under the same advantages, it could and would have shown a superiority of from 30 to 40 per cent. over its competitors.

By giving the above a place in your columns, you will greatly oblige yours, etc.,

C. N. ELLIOTT,
Supt. Ingersoll Rock Drill Co.

COAL TRADE REVIEW.

Import Duty on Coal.

Anthracite free. *Bituminous*, per ton of 28 bushels, 80 lb. to the bushel, 75c., gold.

All *slack*, or *culm*, such as will pass through a half-inch screen, per ton of 28 bushels, 80 lb. per bushel, 40c., gold.

Not otherwise provided for, per ton, 40c. gold.

NEW YORK, June 6, 1874.

The Production of Anthracite Coal for the week ending May 30, 1874, was as follows:

Ton of 2240 lb.

	WEEK. Tons.	YEAR* Tons.
Wyoming Region.		
Delaware and Hudson Canal Co	61,464	1,015,592
Delaware, Lackawanna and Western R.R	68,404	1,040,539
Pennsylvania Coal Co	30,488	484,380
Lehigh Valley R.R	21,400	413,443
Pennsylvania and New York R.R	1,935	29,881
Central Railroad of New Jersey	45,265	530,060
	228,956	3,513,895
Lehigh Region.		
Lehigh Valley R.R	75.612	1,235,010
Central Railroad of New Jersey	37,435	397,633
†Danville, Hazleton & W. B. R.R	2,106	8,464
	115,153	1,641,107
Schuylkill Region		
Philadelphia and Reading R.R	132,139	1,876,406
Shamokin and Lykens Valley	24,159	293,580
	156,298	2,169,986
Sullivan Region.		
Sullivan and Erie R.R	534	11,512
Total of all the regions	500,941	7,336,500

* Year beginning Jan. 1.
† From the Penn. R.R. Co.'s report, May 16.

The Production of Bituminous Coal for the week ending May 30th, was as follows:

Ton of 2000 lb.

	Week. Tons.	Year. Tons.
Cumberland and Pennsylvania R.R	61,481	790.595
Cumberland Branch R.R	5,935	79,953
Barclay R.R	9,251	110,208
Huntingdon & Broad Top R.R	4,919	99,522

Hereafter the above table will give the shipments in tons of 2,000 lb., while heretofore it only gave the figures as they were reported by the companies. Our motive in reporting bituminous coal in tons of 2,000 lb. is that the majority of the coal is so sold.

The Production of Bituminous Coal on the line of the Pennsylvania Railway and branches as per report for the week ending May 23d:

Tons of 2000 lb.

	Week. Tons.	Year. Tons.
Snow Shoe	1,431	27,561
Tyrone and Clearfield	13,669	242,184
Allegheny Region, Penn. R.R	5,079	98,509
West Penn. R.R	3,673	88,351
Southwest Penn. R.R	544	2,639
Gas Coal, Penn. R.R	22,755	335,261
Pittsburgh Coal, Penn. R.R	10,493	160,485

The Production of Coke on the line of the Pennsylvania Railway and branches, as per report for the week ending May 23d:

Ton of 2000 lb.

	Week. Tons.	Year. Tons.
Tyrone and Clearfield	..	212
Allegheny Region, Penn. R.R	....	46
West Penn. R.R	1,562	25,323
Southwest Penn. R.R	7,138	158,414
Gas Coal, Penn. R.R	660	16,480
Pittsburgh Coal, Penn. R.R	1,006	3,638

† From Penn. R.R. Co's report for the week ending May 2nd.

Chesapeake and Ohio Railroad.

Coal received from mines for week ending May 23, 1874:

Ton of 2000 lb.

	TONS.
Cannel Coal	320
Splint "	3,010
Bituminous Coal	90
Total	3,420

Coal shipped from Pictou, N. S., for the week ending May 30, 1874.

DESTINATION.	WEEK.	YEAR.
United States	963	5,570
West Indies	....	1 150
Canada	4,429	12,944
Other provinces	2,076	11,928
	7,468	31,592

The shipments of coal from Port Caledonia, C. B., from Jan. 1 to May 27, say, to the United States, 5521 tons; British Provinces, 370 tons; total, 5891 tons.

Our table of anthracite production gives for the week 500 941 tons, as against 495,185 tons for the previous week, and 449,448 tons for the corresponding week last year. The total production for the year is 7,336,500 tons, as against 6,722,117 tons for the corresponding period of 1873. These figures show an increase for the week, this year, of 50,493 tons, and for the year of 614.383 tons. The figures of last year we take from the Pottsville *Miner's Journal*.

The receipts for shipment at Coal Port for the week were 7941 tons, and the shipments 9251 tons.

The receipts at South Amboy were 14,118 tons and the shipments 16,560 tons. The total receipts at these ports, since January 1, were 383 506 tons, and the shipments 335,481 tons, showing an accumulation of 48,025 tons since that date.

The receipts at Greenwich, Philadelphia, were: bituminous, 3450 tons, and gas coals 5804 tons; shipments, bituminous: 3775 tons, and gas coals 5090 tons; balance on hand, bituminous 1687 tons, and gas coals 2355 tons.

The production of Cumberland coal from January 1st to May 30th, was 777,275 tons, of 2240 lb., as compared with 848,906 tons for the corresponding time last year. The production for the week was 60,193 tons, as compared with 58,394 tons for the corresponding week in 1873. This shows an increase of 1799 tons for the week, and a decrease of 71,631 tons for the year.

Wholesale Prices of Anthracite f.o.b., at the Tide Water Shipping Ports per ton of 2240 lb.

	Lump.	Steamer.	Grate.	Egg.	Stove.	Chestnut.
Wyoming Coals.						
*Lackawanna and Scranton at E'port & Hoboken	4 80	4 90	5 00	5 15	5 65	4 60
Pittston at Newburgh	4 65	4 65	4 75	4 85	5 40	4 50
Wilkesbarre at Port Johnston	4 80	4 90	5 00	5 15	5 65	4 60
Newport and Pymouth	....	....	5 00	5 15	5 85	4 60
Susquehanna Coal Co. at Amboy	4 95	5 05	5 10	5 25	5 75	4 70
Kingston at Hoboken	4 80	4 90	5 00	5 15	5 65	4 60
Lehigh Coals.						
Old Company at Port Johnston	5 75	....	5 70	5 70	5 60	4 60
Old Company's Room Run	5 20	....	5 20	5 25	5 85	4 90
Sugar Loaf at Port Johnston	5 75	....	5 70	5 70	5 70	4 75
Lehigh Coal Exchange	5 60	....	5 55	5 55	5 70	4 75
Honey Brook at Elizabethport	5 60	....	5 55	5 55	5 70	4 65
Spring Mt. C. Co. at Hoboken	5 60	5 60	5 55	5 55	5 85	4 90
Beaver Meadow at South Amboy	5 75	....	5 70	5 70	5 70	4 75
McNeal at Port Johnston	5 60	5 60	5 55	5 55	5 60	3 75
Schuylkill Coals at Port Richmond.						
Schuylkill white ash	4 30	4 40	4 50	4 65	5 15	3 75
Schuylkill red ash	...	....	4 65	4 80	5 15	4 00
Shamokin white and red ash	....	....	4 75	5 10	5 15	4 20
N. Franklin	....	....	5 10	5 10	5 30	4 00
Lorberry	....	....	5 25	5 25	6 05	4 10
Lykens Valley	....	....	....	6 00	5 85	4 70

* f. o. b. in New York Harbor.

† These prices are for registered contracts. Buyers not having contracts will be charged 15 cents per ton more than above prices.

Lehigh Pea is quoted at $3.95.

	Per ton.
Freight from Hoboken and Wehawken to New York	40c.
" " Elizabethport & Port Johnston, to New York	45c.
" " South Amboy to New York	50c.
" " Newburgh to New York	65c.
" " Port Richmond, "Phila." alongside to N. Y.	95c.
" " Rondout to New York by boat or barges of the D. & H. Canal Co. "delivered"	50c.

RETAIL PRICES

per 2000 lb. are as follows:

	Grate and Egg.	Stove.	Chestnut.
Pittston coal, in yard	$5 90	$6 10	$5 30
Delaware & Hudson, in yard	6 25	6 50	5 70
Scranton, in yard	7 00	7 25	6 55
Wilkes-Barre, delivered	6 85	7 10	6 75
Lehigh & Locust Mountain,	7 25	7 75	6 53
Schuylkill Red Ash	8 00		

Anthracite.—The usual dullness has to be recorded as prevailing during the past week in this trade. Retail prices have been put down to about $7 25 per ton, while it is claimed they should be at least $8 or $8 25. Of course, the companies disavow any direct interest in this competition, but it is generally believed, though it may be unjustly so, that the sources of war are supplied by the principals, directly or indirectly.

When it is known that the agent of one of the companies, who, it is claimed, receives but 15 cents per ton commission for guaranteeing sales, can pay 10 cents a ton to a sub-agent who guarantees nothing, the trade generally is inclined to think there is a consideration somewhere, that is not expressed in the famous programme. There can, however, be no doubt whatever that the agreement is as closely carried out as any agreement of the kind is ever likely to be; the *surveillance* of each company on the doings of the others insures this. The dullness in trade which we chronicle from week to week, must not be interpreted as meaning that no coal is being sold, for our statistics of production show that we have mined and sent to market 7,336,500 tons of anthracite, or 614,383 tons more than during the same period last year. It is true, our stocks on hand are very large, amounting to fully one million tons at the tide water ports, a figure higher than is usual by several hundred thousand tons. It is equally true that our sales of anthracite have exceeded those of last year, and the coal has been used, for consumers are not carrying as heavy stocks as they formerly did, feeling satisfied the combination can and will maintain the programme agreed upon. The great secret of the dullness of the anthracite trade is that the business is concentrated in the hands of a very few dealers, and the great number of middle men who still linger in the trade have little or nothing to do except talk, and we consequently hear on every side the reports of "stagnation," "nothing doing," etc., which the figures of production do not confirm. In the natural course of trade, our consumption should have been much larger this year than it is, and this makes the trade *comparatively* dull, but there is no such *absolute* depression in business, if we except the iron trade, as the reports of our middle men would lead us to believe.

At this season the coal business is always slack, and we do not look for any great revival for the next two or three months, but the prospect for the fall trade is not discouraging.

Bituminous Coal.—There is little doing in bituminous coal beyond filling contracts made earlier in the season. We learn of small sales of Cumberland at from $4 35 to $4 45 at Georgetown, but the total amount of these is quite unimportant. An effort is being made to introduce the Keystone coal, which is claimed to be mined from the same vein as the George's Creek coal, but to be intermediate in quality between the true dry Cumberland coals and the caking coals of the Youghiogheny region. We have heard both favorable and unfavorable opinions of these coals expressed. The trials here have not yet been sufficiently extended to thoroughly test their quality. Efforts are also being made to develop the James River coal field, and particularly that part of it which produces the peculiar variety of coal called carbonite. The geographical position of this field is very favorable, and, with an equally good fuel, would enable the miners there to either greatly undersell all other bituminous coals sent to market, or make very large profits on their coal, selling it at living prices for the Maryland, Pennsylvania, or West Virginia fields.

The Kanawha coals are growing in popularity as they become known. We have to record a further sale of 3,000 tons Cannelton cannel at $12 50 delivered at New York.

We note also a sale of 3,000 tons of Waverley County Youghiogheny coal at $7 50 delivered in this city.

The Provincial coals received at New York for the week ending June 4 amounted to 1,757 tons. Previously reported this year 2,759 tons, making a total to date 4,516 tons. At present rates of freight these coals can be put down here at little over $5 per ton, and with the signing of a reciprocity treaty will have a further advantage of 75 cents gold per ton of 2,000 lb. With the revival of business, which may reasonably be expected this fall, there is every prospect of an important increase in this trade.

On the other hand, we are greatly increasing our exports from Western Pennsylvania to Canada, and have to record this week a contract with the Great Western Railway of Canada for 15,000 tons of Red Bank coal, at $5 per ton of 2000 lb., at the Suspension Bridge. We have also to note sales of 3000 tons of Red Bank orrel and cannel, for gas purposes in Canada, at $5 and $5 50 per ton respectively, at Buffalo. Also, a contract by the same company with the City of Philadelphia for their supply of cannel for the fire department, at $9 50 per ton.

Very little English coal is now coming to this country. There were no receipts during the past week, but there are two small cargoes, about 450 and 600 tons, of Newcastle gas coal now on the way here. One of these cargoes is expected daily. There is also a cargo of about 700 tons of gas cannel on the way, and we hear of a small quantity of an Australian shale on the way here. It is said to yield a gas of very remarkable illuminating power, is valued at about $40 per ton, and is to be used solely as an enricher.

Freights both for coasting trade and to foreign ports continue very low.

We note the following export freights for coal:

From Baltimore to St. Thomas, an American brig, 229 tons, at $2 75 per ton, freight.

From Baltimore to Bermuda, an American brig, 487 tons, at $2 75.

From Baltimore to Jamaica, an American brig, 340 tons, at $3.

From Philadelphia for St, Johns, N. B., a schooner at $2 per ton.

WHOLESALE PRICES. F. O. B., AT NEW YORK.

Broad Top	6 00@ $6 25	Block House	6 00
Derby	6 25	Ohio Caking	10 00
Kittaning	6 25	Ohio Cannel	12 50
Clearfield, Sterling	6 25	Lyonsdale Coal	11 50
George's Creek, Cumberland	6 50@6 75	James River Bit	6 50
West Virginia Gas.	7 40@7 50	" Carb	9 00
Peytona Cannel	12 50	*Cannelton Cannel	12 50
Penn. Gas	7 50@7 65	Liverpool Gas Cannel, ex ship	15 00@15 50
Westmoreland Gas.	7 50@7 65	" House	18 00
Sterling Cannel	14 00	‡Newcastle Gas	8 00
" " del'v'd.	16 00	Red Bank Cannel	9 00
Caledonia	6 00	†Cannelton Splint	8 00
Waverly Co. Youghiog'y.	7 50		

Freight from Richmond, Va., to New York, $2 00@2 10.
* $11 f. o. b. at Richmond.
† $6 " "
‡ Delivered at wharf.

RETAIL PRICES IN NEW YORK.

Liverpool House Orrel	$20 00@22 00
Liverpool House Cannel	@25 00
American Block	16 00@
Straitsville Cannel	16 00@
Carbonite	11 00@

The following are the prices of provincial coals, f. o. b., at the shipping ports of the mines:

PRICES IN GOLD F.O.B. AT THE SHIPPING PORTS OF THE MINES.

	Coarse.	Slack.		Coarse.	Slack.
Block House	$2 25	$1 25	Sydney, Reserve mine	2 60	
Gowris	2 00	1 50	Lingan	2 50	
Pictou, Albion mine	3 00	1 50	Caledonia	2 00	1 00
Pictou, Vale m.	3 00		Glace Bay	2 00	1 00

Freights from Cape Breton to New York, $2 75.

Coal Trade of Philadelphia.

Philadelphia, May 26.

Reported by our Special Correspondents.

Anthracite.—To say that the trade is duller after all that has been said about dullness, would seem like exaggeration, but is nevertheless true. The class of orders generally expected at this season of the year is not coming as rapidly as was expected. Freights seem to have settled down to $2 to Boston, $1 75 to Providence and lower to Southern ports than they have been known to be for years—$1 to Washington, 90c. to Norfolk, and $1 10 to Richmond. In the meantime, the shipments from the mines remain large, and how they are disposed of remains a mystery. A continuation of the same condition of things would upset all ideas of trade and show that the consumption has nothing whatever to do with the production. It would leave a bright future for the coal trade. If production can keep up and prices go up when the demand is so reduced, it is natural to infer that when the demand is good the production can attain proportions far beyond the most sanguine calculation. It must be a conundrum to political economists, and the best of them will have to give it up.

BITUMINOUS COAL AT PHILADELPHIA.

Penn. and Westmoreland (Gas), f.o.b., Greenwich	6 25
Broad Top, (according to destination,) f. o. b., Port Richmond	4 75@5 00
Clearfield f. o. b. at Greenwich, according to destination	4 75@5 00

BITUMINOUS RETAIL AT PHILADELPHIA.

$6 in yard, per 2240 lb., cartage added.

All bituminous coal shipped from wharves is sold per ton of 224c lb. Coal sold in the railroad cars is all per ton of 2000 lb., R. R. freights being so charged.

Clearfield and Broad Top coal may be quoted in cars at mines for coal trade at $1 25 per 2000 lb.

Philadelphia and Reading Railroad Company,

OFFICE, 227 SOUTH FOURTH STREET.

PHILADELPHIA, May 27th, 1874.

ROBERT B. CABEEN, Esq., has been elected President *pro tempore* of the Company, to act during the absence of the undersigned.

Until the return of the latter, all communications and reports such as have heretofore been sent to the President (other than those relating to the Transportation Department) will be sent to Mr. J. W. JONES, first Vice-President, and those relating to the Transportation Department, both railroad and canal, will be addressed to Mr. G. A. NICOLLS, second Vice-President.

FRANKLIN B. GOWEN, President.

Line Prices for June, 1874.

WHOLESALE.

AT	Lump and Broken.	Egg.	Stove.	Chestnut.	Pea.
Carbondale	2 25	2 25	2 50	2 00	1 25
Fair Haven, Vt	5 50	5 50	5 95	5 45	....
Ithaca, N. Y	4 40	4 40	4 85	4 35	....
Mauch Chunk, Lehigh coal	3 35	3 35	3 60	3 10	....
" Newport coal	1 25	3 25	3 25	3 60	3 10
" Wilkes B. coal	3 25	3 35	3 65	3 10	....
Pittston Junction	2 50	2 25	2 50	2 25	....
Port Carbon	2 75	3 00	3 15	2 40	1 25
*Port Clinton	2 94	3 19	3 34	2 59	1 44
†Schuylkill Haven	2 94	3 08	3 23	2 48	1 33
Scranton	2 25	2 25	2 50	....	1 25
Wilkes-Barre	2 25	2 25	2 50	2 00	1 25
Waverly, N. Y	4 00	4 00	4 40	4 15	....
Syracuse, N.Y	4 55	4 50	4 95	4 20	....
Oswego and Buffalo, N. Y	5 50	5 50	5 90	5 45	....

Lehigh furnace lump remains at $3 25, without commission.
† By Railroad and Canal.
* By Canal.

Georgetown, D. C., and Alexandria, Va.

George's Creek and Cumberland f.o.b. $4 40@$4 55, wholesale.

Baltimore, Md.

Specially reported by E. STABLER, Jr., coal merchant.

WHOLESALE PRICES PER 2240 lb.

ANTHRACITE.

	afloat.	at depot.
Wilkes-Barre, "Lee," or "Diamond,"		
Lump, steamboat or broken	$5 05@$5 10	$5 60
Egg	5 45	5 90
Stove	5 57	5 90
Pittston and Plymouth.		
Lump, steamboat, and broken	....	5 35
Egg and stove	....	5 65
"Boston" (free burning,) all sizes	5 45	5 65
Shamokin, red or white ash, all sizes	5 45@5 60	5 50@5 60
Lykens Valley, red ash, all sizes	5 50	5 80

From wharf or yard, wholesale, 50@75c. additional.
By retail, all kinds and sizes, $7@8 00.

BITUMINOUS.

George's Creek and Cumberland f. o. b. at Locust Point for cargoes	4 60@4 85
West Va. Gas Coal f. o. b. at Locust Point	5 50@....
Kanawha Cannel, coarse	13 00@....
Tyrone	7 25@....
Ritchie Mineral of West Virginia	1 00@....

Boston, Mass.

June 2, 1874.

Reported by our Special Correspondent.

Never were we so perplexed in reporting trade. In the aggregate, considerable coal was sold during the latter part of May, taking advantage of June rates and the unusually low rates of freights. It would be folly to state that the current monthly rates are being adhered to.

The sale of 10,000 tons by the P. & R. R. Co. to the Manchester Print Works is subject to comment; figures here not known, but understood to be less than regular price. There is a rumor that Mr. Quintard has invited the treasurers of the New England manufacturing concerns to visit the coal mines of Pennsylvania at the company's expense. That bait will not take.

Cumberland coal is in full sympathy with anthracite. Vessels offering from Georgetown at $2 40, and Baltimore at $2 25@$2 50.

Receipts of coal at this Port for the week ending May 29:

	Week. Tons.	Year. Tons.
Domestic	39 585	316,015
Foreign	352	3,787

CARGO PRICES TO TRADE.

Lingan coal	$6 37	Westmoreland	8 50
Caledonia	6 00	WarelyCo. Youghiogheny	8 50
Picton	$6 75@ 7 00	Cannelton Cannel	14 00
Block House	6 25	Cumberland	7 00@ 7 25
Red Bank Cannel	11 00	Anthracite,	6 25@ 7 50

Burlington, Iowa.

MAY, 30, 1874.

Specially reported by Messrs. WIGHTMAN & CUMMINGS, wholesale and retail dealers and shippers of coal.

There has been but little doing, and few changes since our last report. Stocks in yards are small and prices continue steady. We quote:

Lehigh Lump	$16 00	Illinois Smithy	$6 00
" prepared	13 00	" Steam	3 75
Blosburg Smithy	13 00	Connellsville Coke	13 00
Pittsburgh "	10 00	Illinois "	10 00

Buffalo, N. Y.

Reported by our Special Correspondent.

June 2, 1874.

Youghiogheny Gas Coal	$6 00	Connellsville coke	8 00
Catish Lump	4 75	Beaver Gas Coal	6 50
" Nut	3 50	Red Bank Cannel	5 50
" Nut and Slack	3 00	" Orrel	5 00
" Slack	2 85		

Anthracite f. o. b. vessel. Retail prices $1 per ton additional, delivered.

Lump	$6 50	Stove	6 45
Grate	6 00	Chestnut	5 95
Egg	6 00		

Chicago, Ill.

June 2, 1874.

Specially reported by Messrs. RENO & LITTLE, Coal Merchants

Retail prices per ton of 2000 lb. delivered to buyer.

Lehigh Lump	$10 50	Walnut Hill (W. Va)	6 50@ ....
Lehigh prepared	10 00	Midway (West Va.)	6 50@ ....
Lackawanna, Wilkes-Barre and Pittston, Grate, egg, and chest	8 50	Cannel	8 00@ 9 00
		Blossburg	8 50
Stove or range	9 00	Indiana Block	6 50
BITUMINOUS.		Hocking "Brooks"	6 50
Briar Hill and Erie	7 50@	Wilmington and Illinois	5 00

Cincinnati, O.

June 2, 1874.

Specially reported by Messrs. A. BUCHANAN & Co., wholesale and retail dealers in coal and coke.

The report of last week will do to republish this week, as there does not appear to be any change in the market, and nothing of interest has transpired that we have been able to note.

Per 2000 lb.

	Bush.	Tons.
Youghiogheny, or Pittsburgh, afloat	10 c.	$2 80
Pomeroy coal	6c.@7 c.	1 96
Cannel coal	18 c.	5 04
Semi Cannel	9 c.	2 52

The following are retail prices delivered:

Youghiogheny	13 c.@	$3 64@$
Pomeroy	11 c.@	3 08@
Cannel	22 c.@	6 16@ 6 72
Kanawha Semi Cannel	— 13 .	— 3 64
Anthracite	— -	— 11 00
Foundry coke	— 11c.	—
Soft coke	— 9c.	—

Cleveland, O.

June 2, 1874.

Reported by our Special Correspondent.

No change in prices, coal market very dull. Supply greatly exceeds demand. Shipments via lake would undoubtedly cease entirely were it not for the very low rates of freight offering.

	Per ton.		Per ton.
Youghiogheny, l'p, f.o.b.	$4 75	Straitsville	$3 50
Youghiogheny, nut	3 75	Columbiana	3 75
Briar Hill, (Church Hill)	4 65	Strip Vein	4 00
" " (Brookfield)	4 50	Mountain Blossburg (blacksmith)	6 00
Massilon, according to quality	$3 75 to 4 00	Darlington and Sterling Cannel	4 60
Hocking Valley	3 75		

Council Bluffs, Iowa.

Reported by our Special Correspondent.

ON TRACK.

Blossburg (blacksmith)	$14 00	Wyoming	13 00
Anthracite	14 00	Missouri	6 00
Iowa	4 50	Kansas	6 00

RETAIL.

Blossburg	$16 00	Wyoming	$15 00
Anthracite	16 00	Missouri	8 00
Iowa	6 50	Kansas	8 00

Detroit, Mich.

June 2, 1874.

Specially reported by Messrs. ROBINSON & KEYS, dealers in all kinds of coal.

Prices remain as last quoted. Coal is arriving more freely, but the demand is still light.

Lehigh Lump, per ton	$11 00	Briar Hill	8 50
Lehigh nut	10 00	Willow Bank	8 00
Wilkes-Barre, prep. sizes	9 50	Erie	8 75
Blossburg	9 00	Massillon	8 00

Denver, Col.

RETAIL PRICES.

Canon	$6 50	Boulder Valley	$4 75
Marshall	5 50	Eulner	5 50
Murphy	5 50	Black Diamond	5 50
Baker	5 00		

Indianapolis, Ind.

June 1, 1874.

Specially reported by Messrs. H. McCOY & Co.

Trade continues very dull. Prices have declined 10c. per ton on Block and Highland coals since our last report. We quote at wholesale prices on board cars in the city.

Per 2000 lb.

BITUMINOUS.

Best Block coal	$2 80	Indianna cannel	6 50
Best Highland	2 25	Hocking Valley	3 00
Block Nut	1 65	Youghiogheny	4 75
Highland "	1 65	Gas coke, per bushel	12c
Block slack	1 15	Blossburg (smithing) "	27
Peytona cannel	8 50	Piedmont " "	30

ANTHRACITE (Lackawanna).

Grate	$9 25	Chestnut	9 30
Egg	9 25	Stove	9 55

Louisville, Ky.

June 2, 1874.

Specially Reported by Messrs. BYRNE & SPEED.

There has been no change in the coal market since our last report. Pittsburgh is in full supply, and on the river is steady at 10c., with few sales. Kentucky is in very limited demand at 8@8½c. on cars. The Rolling Mills are commencing work, which, to a small extent, will help the coal business. The following are our retail prices:

Pittsburgh, per load	$3 50
Pomeroy	2 75
Buckeye Cannel	5 50
Peytona Cannel	6 00
Nut and Slack	2 75
City-made Coke, per bushel	22c
Anthracith, per ton	$10 to $10 50

New Orleans, La.

May 30, 1874.

Specially reported by Messrs. P. & R. DEVERGES, Wholesale and Retail Dealers in Pittsburgh, Anthracite and Cannel coal.

Since our last report of the 23d inst. there has been a great activity in the wholesale market at prices all in favor of buyers. Several boats have changed hands at 35c. per bbl. We still quote:—

Pittsburgh coal, retail, per bbl	75c.
" wholesale	35c.@37½
" per hhd	$7 00
" to steamboats, per box	50c.
" to manufacturers, per bbl	60c.@
Anthracite, retail, per ton	$12 50
" wholesale per ton	$ 8 50@9 00
Spadra (Arkansas) coal, retail, per bbl	75c.

Pittsburgh, Pa.

June 2, 1874.

Reported by our Special Correspondent.

Coal and coke trade still very dull. River mines generally suspended. Prices unchanged.

Per ton of 2000 lb. and Bushel of 76 lb.

	per ton.		per ton
Youghiogheny coal	$2 25	Anthracite all sizes	$7 00
" coke	2 75	Castle Shannon coal on platform, per bushel	7½c.
Connellsville coal	2 25		
" coke	3 25		

San Francisco.

From the *Commercial Herald* May 21.

Imports of coal from January 1st to May 16th:

	Tons.		Tons.
Anthracite	1,952	Vancouver Island	24,729
Australian	21,506	Bellingham Bay	8,110
Coos Bay	21,718	Rocky Mountain	303
Cumberland	4,820	Seattle	984
English	1,005	Mt. Diablo (3 mos)	54,740

Imports for the week include 1,000 tons Nanaimo per Shooting Star. This comes under an old contract for the entire

Coal Freights from the Anthracite Mines to the Principal Markets.

Schuylkill Coals, per ton of 2240 lb.	From Pine Grove.	From Tamaqua.	From Port Carbon.	From Mount Carbon.	From Schuylkill Haven.	From Port Clinton.
To *Belmont & W. Manayunk, via P. & R. R. R.	$2 12	$2 07	$2 00	$1 99	$1 92	$
* Port Richmond, "for shipment," " "	2 12	2 07	2 00	1 99	1 92	—
* Philadelphia and "retail yards," " "	2 22	2 17	2 10	2 09	2 02	—
† Philadelphia, including the charge for the use of cars, barges, and for toll, via Schuylkill Canal	—	—	—	—	1 75	1 64
* Swede Furnace, " " "	1 88	1 83	1 76	1 75	1 68	—
* Aramingo, " " "	1 62	1 57	1 50	1 49	1 42	—
* Port Clinton, " " "	91	86	79	78	71	—
* Allentown, via East Pennsylvania Branch	1 57	1 52	1 45	1 44	1 37	—
* Col'bia, Lanc'r, & points on Lan. Brch., via R. & C. R. R.	1 77	1 72	1 65	1 64	1 57	—
* Heidelberg, via Lebanon Valley Branch	1 54	1 49	1 42	1 41	1 34	—
* Robesonia, via L. and T. Branch	1 35	1 49	1 42	1 41	1 34	—
* Lebanon " "	96	1 55	1 48	1 47	1 40	—
* Harrisburg and Paxton, via L. and T. Branch	1 38	1 72	1 65	1 64	1 57	—
* Harrisburg, via Schuylkill and Susquehanna Branch.	70	—	1 40	1 39	1 32	—
* Dauphin, via Schuylkill and Susquehanna Branch.	85	—	1 50	1 49	1 42	—
*Jonestown, via Lebanon and Tremont Branch	90		1 80	1 79	1 72	—
† Reading, including charges for the use of cars, barges, and for toll, via Schuylkill Canal	—	—	—	—	95	84
† Bridsburg, add $10 per boat, via Schuylkill Canal	—	—	—	—	65	60
† Trenton, N. J., " "	—	—	—	—	1 00	95
† New York, " "	—	—	—	—	1 62	1 57
† Wilmington, Del., " "	—	—	—	—	85	80
†Bridgeton, N. J., " "	—	—	—	—	1 60	1 55

Lehigh and Wyoming Coals. per ton of 2240 lb.	From Penn Haven.	From Mauch Chunk.	From Hazleton.‡‡	From Upper Lehigh.	From Ashley and Sugar Notch.	Lackawanna Junction.
To ‡ Newark, N. J. via Central Railroad of N. J.	2 49	2 25	2 86	2 87	—	—
‡ Mauch Chunk, Pa. " " "	14	—	56	59	89	—
‡ Phillipsburg, N. J. for consumption	96	82	1 74	1 75	2 64	—
Philadelphia, via N. P. R.R.	1 95	1 75	—	1 94	2 64	—
‡ Elizabethport, Port Johnston, Hoboken and South Amboy, N. J., shipping and wharfage 35c. additional.	2 17	2 03	2 49	3 34	3 64	—
High Bridge, N. J.	2 40	2 20	2 82	2 79	3 09	—
Somerville and Raritan, N. J.	2 80	2 60	3 22	3 19	3 49	—
Elizabeth, Cranford, Westfield and Elizabethport, for cosumption	2 95	2 75	3 37	3 34	3 64	—
¶ Jersey City, N J., & N.Y., towing limits, via Morris Can.	—	2 43	3 17	3 24	3 54	—
Andover, via Del., Lack., and Western R. R.	3 30	—	3 72	4 29	2 84	—
Port Oram, Dover and Boonton	2 80	2 50	3 22	4 79	—	—
§ Trenton, Somerset Junction & Greensburg, via P. R.R., Belvidere division	2 65	1 97	3 07	3 64	—	—
Trenton, for shipment, to tide ports east of N. Brunsw'k	1 85	1 71		2 19	2 41	—
Owego, N. Y.	3 06	2 92	—	—	—	2 18
Auburn	3 34	3 20	—	—	—	2 41
Waverly	2 98	2 84	—	—	—	2 10

* These tolls do not include wharfage or shipping expenses at tide ports.

† Ten per cent. is deducted from these rates for lump, steamboat and broken coal.

‡‡ Rates on line coal from Hazleton are 9c. per ton above these figures.

‡ The cost of unloading is to be added to these rates. No charge less than 40c. per ton will be made for any distance. Tolls from Mauch Chunk to Phillipsburg for way points will be $1 15 per ton.

§ Twenty cents per ton less when five cars at a time to one party. Provided that where th reduction makes the rate $1 a ton, or less, the rate will be $1.

¶ 20 cents per ton additional for transferring coal from boat to boat, and 30 cents per ton fo reshipment of same from wharves.

product of the mine; price about $11. The Wellington mine, also in British Columbia, sells ex ship at $9 50@10 per ton. We are advised of a contract purchase of 10,000 tons Australian, to arrive, at or about $9 50. We have before noticed the arrival of the ship General Butler, from Baltimore, with 1,700 tons to a dealer, the trade price of which is, in bulk, $19 50; $21 50 in sacks, and $22 50 in casks. The Coast mines are producing steadily and increasing in quantity, especially the Bellingham Bay and Coos Bay, the former selling at $8 50. The Eastport and other Coos Bay mines are furnishing free supplies at $10. These two last Bituminous enter very largely into use for household purposes, and give good satisfaction, We quote Australian at $9 50@10 50; West Hartley, $12 50. Anthracite scarce, particularly Lehigh, which sells at high figures. The California Mt. Diablo mines, Black Diamond and others, continue to produce largely of Steam Coals, finding ready sale at $6 25@8 25 per ton for coarse and fine—the latter screenings being preferred by all local factories to the lump. The Patterdale, 67 days from Newcastle, N. S. W., has 1698 tons.

St. Louis, Mo.

June 2, 1874.

Specially Reported by the COLLINSVILLE COAL AND MINING COMPANY.

ANTHRACITE.

	City delivery.
Lehigh Lump	$14 50
Lackawanna and Wilkes barre	13 50

BITUMINOUS.

	E. St. Louis.	City delivery
Washington Indiana—smithing	$4 00	$4 87
O'Fallon, Ills.	2 00	3 00
Collinsville and Belleville, Ills.	1 75	2 75
Indiana Cannel	6 00	7 00
Missouri Cannel		5 00

Retail, 25c. per ton additional.

Toledo, Ohio.

Scranton, all sizes	$9 00	Briar Hill	6 00
Lehigh Lump	11 00	Bituminous	4 50@6 50
Blossburg	8 50@ 9 00		

Halifax, N. S.

June 2, 1874.

Reported by our Special Correspondent.

Since our last advices there have been no alterations in the prices of coal.

Prices per ton in gold.

Sydney (old mines)	$7 75	Little Glace Bay	7 50
Other Sydney coals	7 00	Albion (at railroad)	7 50
Gowrie	7 50		

Toronto, Ont.

Prices in gold, per ton of 2000 lb.

Scranton, all sizes	$7 50	Bituminous	7 50
Lehigh prepared	8 50	Blossburg	7 00
" Lump	9 00		

TOWING

FROM NEW YORK TO POINTS ON THE HUDSON RIVER.

	per ton.		per ton.
Manhattanville	8 c.	Haverstraw	17 c.
Spuyten Duyvel	9 "	Verplanck's Point	17 "
Yonkers	10 "	Peekskill & Newburg	18 "
Hastings	11 "	West Point & Cold Sp'g	20 "
Piermont & Dobbs Ferry	13 "	Poughkeepsie	22 "
Nyack & Tarrytown	15 "	Rondout	23 "
Sing Sing	16 "	Hudson	25 "
Croton Landing	17 "		

Boats of 100 tons and under—per boat.

Manhattanville	$11 00	Spuyten Duyvel	$13 00
Yonkers	15 00	Tarrytown	18 00
Sing Sing	20 00	Peekskill	20 00
Newburgh	25 00	Poughkeepsie	30 00

ON LONG ISLAND SOUND.

	per ton.		per boat.
Norwalk & Bridgeport	33½ c.	Port Morris	$20 00
New Haven	33½ "	West Farms, mouth of Creek	25 00
Derby ($50 per b't extra)	33½ "	West Farms	35 00
Southport & Westport	40 "	West Chester	30 00
Milford	40 "	College Point	25 00
Branford	45 "	Flushing & White Stone	30 00
New London	60 "	East Chester Town Dock	60 00
Middletown	65 "	New Rochelle & Glen Cove	50 00
Norwich	68 "	Mamaroneck & Port Chester	70 00
Hartford & Stonington	75 "	Greenwich, Stamford & Darien	75 00
Mystic	75 " per boat		
Harlem	$18 00		
Mott Haven	18 00		

Harbor Towing.

From Hoboken to	Loaded.	Light.
53d st., towing limits	$6 00	$5 00—$11 00
Gowanus	8 00	6 00— 14 00
Newtown Creek	10 00	9 00— 19 00
Port Johnston	9 00	9 00— 16 00
130th street, North River	....	....— 18 00
From East River to Weehawken and return to East River	9 00	7 00— 16 00

To 61st st., $12 extra; to 79th st., $14 extra; to 93d st., $16 extra.

Freights.

Per ton of 2240 lb.

PORTS.	From Baltimore and Georgetown.	From Port Richmond, Philadelphia.	*From Elizabethport, Port Johnson, South Amboy, Hoboken and Weehawken
Augusta, Me	3 50	....	....
Albany	2 30	....	....
Amesbury, Mass	....	....	....
Bangor, Me	3 15	2 50	1 60
Bath, Me	2 25@2 70	....	1 70
Baltimore	....	....	....
Boston, Mass	2 15@2 40	2 00	1 65
Bridgeport, Ct	2 00@ —	1 50	85
Bristol, Ct	....	1 75	1 20
Derby	....	1 50	1 15
Dighton	2 30	....	...
East Cambridge	....	....	††1 65
Fall River	2 15	1 75	1 20
Hackensack	....	....	....
Hartford	2 60	....	1 40
Hoboken	1 80	95	45
Hudson	2 30	....	....
Jersey City	1 80	95	45
Middletown	....	....	1 20
Mystic	....	....	1 15
Newark	2 25	....	....
New Bedford	2 10	1 75	1 25
Newburyport	2 65	2 50	1 75
New Haven	2 00	1 50	85
New London	2 10	1 65	1 10
Newport	....	1 75	1 20
New York	1 80@....	¶ 95	§ 40
Norfolk	90	....	....
Norwalk	2 25	1 50	85
Norwich	2 25	1 50	1 15
Pawtucket	2 50	1 90	‡‡1 30
Philadelphia	1 25	....	....
Portland	2 25@2 50	3 00	1 60
Portsmouth, N. H.	2 50	2 60	1 75
Providence	2 10	1 75	1 20
Petersburg, Va	1 50	....	....
Richmond, Va.	1 10	....	....
Rockport	....	2 70	...
Saco	....	3 00	2 10
Sag Harbor	1 25	....	1 10
Salem	2 55	2 50	1 65
Savannah, Ga	2 25	....	....
Stamford	....	1 50	85
Stonington	....	1 75	1 10
Taunton	....	....	1 60
Troy	2 30	....	....
Warren	....	....	1 20
Washington	....	....	....
Wareham	2 50	....	1 30
Wilmington, Del	1 05	....	....

Freights from Rondout are either 20 cents over New York rates, or New York rates and towing up and down as vessels may elect.

§ Under 150 tons, 50c. per ton.

¶ This is the rate alongside. Delivery on wharf costs from 16c. to 18c. additional.

†† Towing extra.

‡‡ 3c. per ton per bridge extra.

* Freights from South Amboy are 5c. above these rates.

Freights on Bituminous Coals from the Mines to Tide Water Shipping Ports.

From the Mines to Cumberland and State Line the charge is 3 cents per ton of 2240 lb. per mile.

From Cumberland to Baltimore, $2 58 per ton of 2240 lb., or $2 30 per net ton.

From State Line to Amboy, $4 00 per ton of 2000 lb. On coal shipped beyond that point there is a drawback of 50 cents per net ton.

From the Mines to Piedmont, 5 cents per ton of 2240 lb. per mile on distances less than 5 miles, and 4 cents per ton per mile on distances not over 10 miles.

From Piedmont to Baltimore, $2 97 per ton of 2240 lb., or $2 65 on net ton.

From Cumberland to Georgetown by canal, $1 86 per ton of 2240 lb. *To Alexandria, Va.*, 11 cents per ton more.

From Cumberland to Baltimore by B. and O. R. R. per 2000 lb., $2 70; 4 cents additional per gross ton for use of cars.

From any point in the Kanawha Valley to the James River wharves below Richmond by C. and O. R. R., including terminal charges, per ton of 2000 lb., for Cannel coal, $5 35. Subject to rebate on large quantities.

Do., do., for Semi Cannel or Splint, $3 65.

From Irwin to W. Phila. per P. R. R. Penn. and Westmoreland gas coal, per ton of 2000 lb $5 00

From Osceola to W. Phila. per T. & C. R. R., bituminous coal of 2000 lb 3 55

From Fairmount and Clarkesburg to Baltimore via B. & O. R. R. including loading, per 2000 lb 5 20
On through coal after deducting drawback 4 15

From Richmond, Va., to New York, per 2000 lb ... $2 00@ 2 10
" " " Boston " " " 3 00
" " " Philadelphia " " " 1 75

Geneva and Ithaca R.R.

COAL TARIFF.

Lackawanna Junction to State Line for local points	$2 00
" for Auburn via I. & G. and I. R. R.	1 65
" for all other points on N.Y. C. R. R.	1 29
Through rate Lack. *Junction to Buffalo*	3 66
" " " *Rochester*	3 16
" " " *Phillipsburg*	2 92

An addition of 10c. on lots of less than 25 tons.

Lackawanna Junction to Erie Junction for through points on Erie or A. & G. W. R.R. 1 39

Lehigh and Delaware Division Canals.

MAUCH CHUNK, PA., March 25, 1874.

Until further notice the following rates of toll, via the above canals will be adopted:

From Mauch Chunk to Easton per ton of 2240 lb ..... 46c.
" " " " Bristol or New Hope ..... 70c.
Towing from Bristol to Philadelphia ..... 7c.
On local shipments the toll sheets of 1873 will remain in force.

Erie and Champlain Canals.

NEW YORK AND SHIPPING POINTS IN THE VICINITY TO

* Buffalo and Lockport	$1 85	* Utica, N. Y	1 25
* Rochester	1 75	* Syracuse, N. Y.	1 35
* Burlington, Vt	1 75	*Oswego, N. Y	1 70
Albany	85	Troy	90

* Alongside.

*Montreal, Canada, gold.	$2 75	Ottawa, Canada	3 25
St. Johns, N. B.	2 50	Quebec	3 25

* Harbor towing extra

Delaware and Raritan Canal.

Tolls and Towing for Cargoes exceeding 110 Tons.

Per ton of 2240 lb.

Fairmount to N. Y.	64 c.	Port Richmond anthracite	58 c
Greenwich "	66½c.	Philadelphia bituminous	65½c
Trenton "	35 c.	Mauch Chunk to N. Y. alongside	$2 45
Port Richmond, semi bituminous	65½c.		

Freight on Pittston Coal—From Newburgh.

By boats of the Pennsylvania Coal Co., per ton of 2240 lb.

To Troy, Albany and Stuyvesant ..... 60 c.
" Nyack and Hudson and Boston R.R. dock, Hudson, discharged to cars ..... 50 c.
" Hudson, except as above, Rondout and Poughkeepsie.. 35 c.
" Catskill, at mouth of creek, Sing Sing, Tarrytown, Piermont, and Yonkers ..... 55 c.
" Fishkill Landing and West Point..... ..... 25 c.
" Peekskill, Haverstraw, Saugerties, and Tarrytown... 45 c.
" New York..... ..... 65 c.

THE BRITISH COAL TRADE.

LONDON, May 16, 1874.

At Newcastle a slight improvement is noticed in the Steam Coal trade, but nowhere is business so good as at the same time last year. The all-absorbing subject is the question between capital and labor. Although the troubles with the Durham colliers were supposed to be at an end, yet a new point was brought forward by them, which was, to limit work to ten days instead of eleven per fortnight. The action of the strike committee of the Coal Association, who gave notice that the coal-owners would require another 10 per cent. reduction if the men did not continue to work as before, had some effect; for a number of collieries have since resumed work. At a meeting at Barnsley, of about 100 miners' delegates, representing about 23,000 persons, the feeling shown was, that they were opposed to submitting to any reduction whatever. At a meeting of the masters held at the same time, the general expression was, that unless a reduction of at least 12½ per cent. be submitted to by the miners, they had better close their pits. In South Staffordshire, although the general strike does not seem nearer a settlement, yet there are indications of weakenings. A number of collieries have resumed work, and although the miners' agents state that they are non-union men, yet a good proportion belong to the union. There are rumors that the masters will insist upon an additional reduction beforethey permit the men to resume work, and in the present condition of the coal and iron industries, they are fully warranted in doing so. There have been some additional local troubles, and in some cases strikes have occurred in anticipation of the expiration of their notices and a reduction of wages.

In this city coals are quoted at 23/ 6d.@26/ according to quality. In the Newcastle district good coke has been selling at 18/@20/, delivered at the furnaces. In the Lancashire district slack, at the pits' mouth, is selling at 7 6d.; steam coal, 11/ 6d.; andrgy 9/. In South Staffordshire district, at the collieries where the miners have resumed work at the reduced rates, thick coal seconds are offered at 15/ 6d.; umps, 14/ 6d.; and engine slack, 7/ per ton, The Cannock Chase Railway Colliery Company are quoting cannel gas coal, 15,600 ft. per ton of 2352 lb., £2.

Wales.—There is a fair demand for coal for export. In anticipation of a strike, the ironmasters are not booking orders, and but very little work is being done, hence a very largely decreased consumption of this kind of coal. Mr. R. T. CRAWSHAY proprietor of the Cyfarthfa Works, where the notices have expired, has notified the men, that his works shall not be started unless they submit to a reduction of 20 per cent., and all hands, except some laborers, refused to go to work on Monday. The long-looked for meeting of the iron and coal masters was held on Thursday, at the Royal Hotel, Cardiff, under the presidency of Mr. A. FOTHERGILL, M.P., and was very largely attended. It was resolved that a reduction of 10 per cent. be made at all the collieries and works of the coal and iron associations. It was also resolved that in case the reduction was resisted by the men, the members of the association would not pledge themselves to resume work on the above terms. There have been no meetings of the miners during the past week, but they still show a firm determination to resist any reduction whatever, and a very serious lockout may be anticipated.

Scotland.—The prices of coal are well maintained, although the supply is everywhere fully equal to the demand. At many of the collieries considerable stocks are again beginning to accumulate. This was only to be looked for considering the manufacture of raw iron is so much suspended. There is a considerable number of men at work, but there are still a great many who continue to resist the masters' terms, and a final adjustment of the troubles does not look nearer at hand. Throughout Ayrshire, with few exceptions, the miners are all at work, having accepted, at least temporarily, reductions in their wages, varying from 10 to 50 per cent. In Lanarkshire there are between 7,000 and 8,000 men on strike resisting all further reductions than the 20 per cent. The men who hold out express the utmost confidence in their ultimate triumph, although it is well known that their funds are all but exhausted, and that there is very little chance of a hearty response to the appeal that has been made to those who are at work, to contribute 1/ a week each towards the support of those who are on strike. The understanding with the masters is, that they will not employ any men at a less reduction than 40 per cent.

Boston Stock Market.

BOSTON, June 5, 1874.

The following are the prices bid for copper stocks at the first session of the Boston Stock Board:

Allouez	7¾	Pewabic	8
Calumet and Hecla Co.	129	Phœnix	14
Copper Falls	18	Quincy	35½
Central	—	Ridge	5
Franklin	4	Rockland	—
Mesnard	1	St. Clair	1¾
National	3	Star	—
Petherick	1½		

San Francisco Stock Market.

BY TELEGRAPH.

NEW YORK, June 5, 1874.

The following from the San Francisco Stock Board is dated the 28th ult. Excepting a slight decline in Gould & Curry and Belcher, the list has advanced. A dividend of $1 per share has been declared by the Eureka Consolidated Mining Co., payable on the 5th inst.:

Savage	72¾	Imperial	4⅞
Crown Point	87	Raymond & Ely	21¾
Yellow Jacket	70	Meadow Valley	10
Kentuck	14⅝	Eureka V. G. Bid	10
Chollar Potosi	59	Ophir	—
Gould & Curry	19⅝	Hale & Norcross	—
Belcher	80½		

IRON MARKET REVIEW.

Import Duties.

The following are the duties in Gold on Iron:

Flat Iron, not less than 1, nor more than 6 inches wide, nor less than ⅜, nor more than 2 inches thick. *Round Iron*, not less than ¾, nor more than 2 inches in diameter, and *Square Iron*, not less than ½, nor more than 2 inches square ₱ lb. 9-10 of 1c. *Flat Round or Square Iron*, of larger or smaller sizes than the above mentioned, per lb 1 35-100

Provided, that all iron in slabs, blooms, loops, or other forms, less finished than bars, and more advanced than pig iron, except castings, shall pay the same as iron does.

Provided, that none of the above iron shall pay less than 31½ per cent.

Railroad Iron.....63c. per 100 lb.
Boiler plates, or other plate iron not less than 3-16 of an inch thick, per lb..... 1 35-100 c.
Scrap castings per ton..... $5 40
" *wrought* " " 7 00
Pig iron per ton..... 6 30
Iron ore 10 per cent. *ad valorem.*

New York.

June 5, 1874.

Trade continues as heretofore reported, being about as dull as it is possible for it to be. The consumptive demand is not worthy of note, and but one gentleman has shown a speculative spirit for some time past. The feeling that we are to have lower prices still continues; but there appears to be a temporary firmness on the part of makers and dealers. The predictions of buyers as to the extent prices will decline, are in some cases so extreme that we would not dare to express them until further developments indicate with some certainty the probable course of events.

American Pig.—The sales of the past week may be used as a basis of current prices, but beyond that are of little importance. We note sales of 200 tons No. 1 Allentown at $32 50, and a few hundred tons of other good brands of No. 1 at $32, We have seen letters offering good No. 1 iron at $31, and No. 2 at $29, and have no doubt that considerable could be bought at these figures; although in conversation with the representative of one of the largest Lehigh manufacturers, he informed us that he would not make contracts at even higher prices. The quotations of to-day may be stated at $31@$32 50 for No 1; $29@$30 for No. 2, and $25@$28 for forge.

Scotch Pig.—This is even worse than American Pig, and we learn of no transactions upon which to base prices. We have no cable information, and in its absence do not suppose there can have been any material change. Our latest advices by mail state that the market is very irregular—fluctuating upon the action of the miners and operators. The prospects of a final adjustment of the labor troubles are not so encouraging as they were some time ago. The demand is very light, with some brands entirely out of the market, and prices are only maintained by the smallness of the stock on hand. The stock in this city is estimated at about 2000 tons, with but little arriving, and Coltness almost exhausted. We give the following as nominal quotations; Eglinton, $34@$34 50; Carnbroe, $35@$35 50; Summerlee, $36@$37; Glengarnock, $37, and Coltness $39@$40.

Iron Rails.—We are in receipt of Messrs. BIGELOW & JOHNSTON'S circular, reviewing the business of May, and quote as follows: "There is nothing new to report in this department, and in the absence of business it is almost useless to quote Foreign. Prices are nominal. In American one or two transactions have occurred on private terms, but the prevailing depression is manifest in the anxiety shown to meet buyers who make any trustworthy propositions. Upon the whole, we do not think the situation improved in the least since our last circular, and the prospect is by no means encouraging." We quote to-day, American at works $56@60, and English nominal.

Bessemer Rails.—We note sales of 2000 tons by the Cambria Iron Works to a Western road, on private terms. Being unable to procure prices of actual transactions, and in the absence of business in Foreign, we nominally quote: American at $98@100, currency, at the mills, and Foreign at $95@97 50, gold, here.

Old Rails.—We note the sale of about 4000 tons, mostly Ts, with some bridge and double-heads. The price is not known, but supposed to be low. We are informed that this concentrates a stock of about 9000 tons in the hands of one operator, leaving, perhaps, but about 500 tons outside of this in this market. Such being the case, it will be impossible to give a quotation until an inquiry is made for a round lot.

Scrap Iron.—We note the sale of 300 tons No. 1 scrap, for shipment to an eastern port, at $40. The quotations of to-day may be stated at $36@$40. Cast is quoted at $22@$28.

Spiegeleisen.—There is nothing doing, and we quote nominally at $55 gold.

Messrs. BIGELOW & JOHNSTON report the following importations at this point:

	May.	From January 1st	Same time in 1873.
Iron rails			34,249
Steel rails	8,035	32,067	34,882
Old rails	27	649	6,687
Pig iron	2,590	17,131	28,368

Baltimore,

May 30, 1874

The market for pig is dull, and we learn of no movement beyond small sales for foundry purposes. We quote as follows: Anthracite at $33 per ton for No. 1; $32 for No. 2; and $29 for No. 3. Baltimore charcoal forge at $43, and Scotch pig, nominally, at $45 from yard.—*American Commercial Advertiser.*

By an accident which occurred after the proofs had been read, a portion of our Cincinnati quotations, in our last issue, were placed under Baltimore, and a portion of our Cleveland quotations under Cincinnati,

Cleveland

June 2, 1874.

Specially reported by Messrs. C. E. BINGHAM & Co., dealers in pig iron and iron ore.

Our market remains dull, and shows no signs of immediate improvement. Prices continue unchanged. We quote as follows:

No. 1, Anthracite Foundry	$33 00	@34 00	—4 mos
No. 2, " "	30 50	@32 00	—4 mos
No. 1, Bituminous "	33 50	@34 50	—4 mos
No. 2, " "	31 00	@32 50	—4 mos
No. 1, Grey Forge Bituminous	27 00	@29 00	—4 mos
No. 2, Close Grey	26 00	@27 00	—4 mos
No. 1, Massilon Black Band	36 00	@37 00	—4 mos
No. B-1 " "	34 50	@35 50	—4 mos
No. 2 " "	33 00	@34 00	—4 mos
No. 1, Lake Superior Charcoal	40 00	@41 50	—4 mos
No. 2, " "	38 00	@39 00	—4 mos
No. 3, " "	43 00	@44 50	—4 mos
Nos 4, 5, 6, " "	47 00	@50 00	—4 mos
American Scotch	34 00	@35 00	—4 mos

Chicago

June 2, 1874.

Specially reported by Messrs. ROGERS & Co., dealers in Scotch and American pig iron.

We have no change to report since our last, except in Lake Superior charcoal pig, which quotations may be reduced $1 per ton.

No. 1 Coltness	$46 00	@	....
No. 1 Gartsherrie	45 00	@	....
No. 1 Summerlee	44 00	@	....
No. 1 Glengarnock	42 00	@	....
No. 1 Eglinton	38 00	@	....
Warner's "American Scotch"	38 00	@	....
No. 1 Grand Tower Mo. ores (Bituminous)	36 00	@	....
No. 2, " " "	32 00	@	....
No. 1 Forge	32 00	@	....
Union "A" 1 (Anthracite)	35 00	@	....
Union "B" 1 (Anthracite)	32 00	@	....
No. 1 Lake Superior (charcoal)	40 00	@41	00
No. 2 Lake Superior "	37 00	@39	00
No. 3 Lake Superior "	42 00	@44	00
No. 4 Lake Superior "	44 00	@47	00

Cincinnati.

June 2, 1874.

Specially reported by Messrs. TRABER & AUBERY, commission merchants for the sale of pig iron, blooms, ore, etc.

We have no improvement to note in our market for pig iron. The demand is very limited, and prices are still drooping We quote:

CHARCOAL.

Hanging Rock, No. 1, Foundry	$35 00	@36 00	—4 mos
" No. 2, "	33 00	@34 00	—4 mos
" Mill	30 00	@— —	—4 mos
Tennessee No 1, Foundry	34 00	@35 00	—4 mos
Tennessee. No. 2 "	32 00	@33 00	—4 mos
" Mill	29 00	@30 00	—4 mos
Missouri, No. 1, Foundry	36 00	@37 00	—4 mos

STONE COAL.

Ohio No. 1, Foundry	33 00	@34 00	—4 mos
" No. 2, "	32 00	@33 00	—4 mos
Ohio Mill	29 00	@30 00	—4 mos
Missouri, No. 1, Foundry	33 00	@34 00	—4 mos
" No. 2, "	32 00	@33 00	—4 mos
" Mill	29 00	@30 00	—4 mos

CAR-WHEEL.

Hanging Rock, C. B.	55 00	@58 00	—4 mos
Tennessee "	50 00	@55 00	—4 mos
Missouri "	50 00	@55 00	—4 mos
Alabama "	50 00	@55 00	—4 mos

BLOOMS.

Charcoal	85 00	@100 00	—cash

SCRAP IRON.

Cast	75 00	@100 00	—cash
Wrought	1 25	@ 1 50	—cash

Detroit.

June 2, 1874.

Scotch pig, net	$44 00	@	....
Lake Superior pig, No. 1	44 00	@	....
" " No. 2	43 00	@	....

Louisville.

June 2, 1874.

Specially reported by GEORGE H. HULL, Esq.

The market is dull and lower for nearly all grades. Large sales can only be effected by making some concessions, the legitimate demand being confined to small lots for immediate use.

The usual time, 4 mos., is allowed on the quotations below:

HOT BLAST—CHARCOAL.

No. 1 foundry, from Hanging Rock ores	$34 00	@36	00
No. 2 " " "	30 00	@32	00
No. 1, forge, " "	27 00	@28	00